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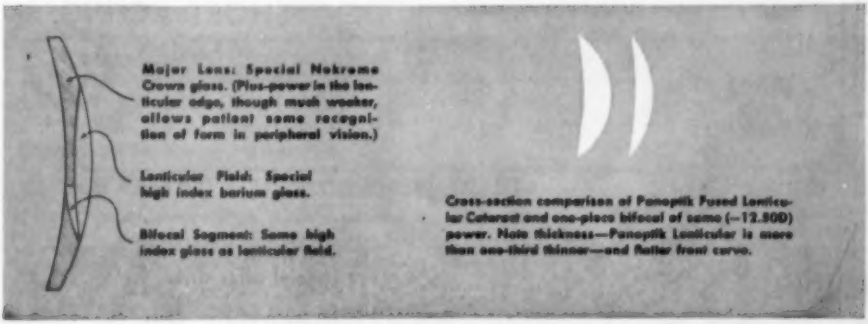

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Fig. 1

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Fig. 2

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AMERICAN JOURNAL OF OPHTHALMOLOGY

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A STUDY OF THE ROLE OF TOXOPLASMOSIS IN ADULT CHORIORETINITIS*

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Baltimore, Maryland

In 1952, Helenor Wilder[1] reported finding certain bodies, identical morphologically with Toxoplasma protozoa, in the choroidal lesions of a group of cases which heretofore had been regraded as atypical chorioretinal tuberculosis. This report immediately reopened the moot question if a Toxoplasma infection was an actual cause of adult chorioretinitis and how frequent a cause it might be.

For years it had been clearly recognized that infantile chorioretinitis might be caused by an in utero infection with Toxoplasma. These infants usually presented a more or less characteristic picture with an associated encephalitis, hydrocephalus, mental retardation, other neurologic signs, and often cerebral calcification. The Toxoplasma had been found histologically in these retinal and neural lesions.[2]

It was also recognized that some children or young adults with histories and retinal scars suggestive of an in utero or infantile toxoplasmosis might undergo later exacerbations of choroiditis. Frenkel[3] attributed these later lesions to a possible rupture of a retinal or choroidal pseudocyst with the liberation of the protozoa in sensitized tissue. This view was, however, not fully accepted, being questioned by Sabin.[4] While it was evident that the congenital form of the disease must be an in utero infection acquired by placental transmission, nevertheless the infected mother was usually asymptomatic.

Acquired adult toxoplasmosis was not so clearly understood. Since the mothers of the Toxoplasma-infected infants were without any stigmas of the disease, it was generally believed that infection in the adult was always asymptomatic. However, in 1940 Pinkerton and Weinman[5] reported a fatal case of adult toxoplasmosis in which the parasite was demonstrated in the tissues post mortem. Since then four other similar fatal cases have been reported.[6-9] Nonfatal symptomatic cases, in which the diagnosis was made by serologic tests, have been reported by a number of observers.[10-12]

The clinical picture in this symptomatic form has been well summarized by Frenkel and Friedlander.[13] The usual symptoms are fever, pneumonitis, hepatitis, lymphoadenopathy, often an exanthematous rash, and sometimes signs of a meningo-encephalitis. Magnussen[14] and Wising[15] emphasized the resemblance of acute adult toxoplasmosis to infectious mononucleosis. In the recovered or latent stage of the disease the patients showed only the scars or residua of the former infection.

With two exceptions (the cases reported by Magnussen and Wising) none of the reported cases of symptomatic adult toxoplasmosis showed any ocular involvement. It was therefore widely believed that, just as the systemic infection was usually asymptomatic in adults, their eyes were also im-

* From the Wilmer Ophthalmological Institute of The Johns Hopkins University and Hospital and the Laboratory of Tropical Diseases, National Microbiological Institute, Bethesda, Maryland. This investigation was supported in part by the National Institute of Neurological Diseases and Blindness, Public Health Service.

mune to Toxoplasma infection, the parasite having a peculiar affinity for embryonic or infantile neuro-ectodermal and ocular tissue.

There were, however, exceptions to this generalization. Thus in 1943, Vail, Strong, and Stephenson[16] reported what they believed to be a case of acquired toxoplasmosis chorioretinitis in an adult, and in 1946 Johnson[17] reported 15 cases of chorioretinitis in which he believed positive neutralization tests pointed to a Toxoplasma etiology.

In 1951, Rieger[18] reported four cases in adults which he believed were due to acquired toxoplasmosis and emphasized that many cases of perivasculitis retinae and choroiditis juxtapapillaris might be due to this cause. In 1952, he reported 10 additional cases.[19] In 1952, Hogan and his associates,[20] in a comprehensive study, reported four cases in which they believed the evidence of a rising dye test pointed to toxoplasmosis as the cause of an active choroiditis, and, in 1953, Duke-Elder, Ashton, and Brihaye-Van Geertruyden[21] reported a case in which the histologic examination of an enucleated eye and later serologic studies on the patient all pointed to ocular toxoplasmosis. In a histologic study of 32 eyes with similar lesions these same authors found bodies suggestive of Toxoplasma in the sections, but believed they were probably cellular or nuclear debris, rather than the parasite.

In his 1952 paper, Hogan and his associates[20] reported 338 patients with uveitis studied for evidence of toxoplasmosis. Over 50 percent of these patients gave positive dye tests, usually of low titers. Approximately 15 percent gave positive skin tests. Hogan accounted for the low incidence of positive skin tests on the ground that an induration of 10 by 10 mm. was the minimum criterion used by him for a positive test. Complement fixation tests were not done routinely. The incidence of positive dye tests was much greater in the posterior than in the anterior type of uveitis.

In discussing this paper, Feldman[22] pointed out that there is a high incidence of low-titer dye tests in the normal population, and that there is also a high incidence of positive toxoplasmin skin tests. In a series of 144 patients with uveitis and 144 "normal" controls, he found almost exactly the same incidence of positive dye tests. Feldman concluded that many people have antibodies for toxoplasmosis; and that, if acquired adult toxoplasmosis produces chorioretinitis, it must do so with rarity. Last, he pointed out that any significant serologic findings must depend upon changing antibody titers.

In the light of those reports it is obviously necessary to review our ideas on the etiology of granulomatous uveitis and to consider the possible role of toxoplasmosis in the adult disease. In this consideration the first point to be discussed is the value and interpretation of the various serologic tests on which the diagnosis must be based.

Diagnostic tests for toxoplasmosis

1. *The neutralization test.* This depends on the ability of an immune Toxoplasma serum to neutralize the Toxoplasma. This is determined by injecting a mixture of serum dilutions and living Toxoplasma in the shaven back of a normal rabbit. If the serum neutralizes the Toxoplasma, no lesions result and the test is recorded as positive. However, it has been clearly shown that some 10 to 20 percent of known toxoplasmosis patients lack these neutralizing antibodies and also that such antibodies are present in some 10 percent of the serums of normal patients.[23]

2. *The toxoplasmin skin test.* This depends upon a cutaneous hypersensitivity to the specific protein of Toxoplasma and is detected by the intracutaneous injection of the specific antigen—toxoplasmin. This test, however, becomes increasingly positive with age. Sabin and Feldman found it positive in 65 percent of patients over 50 years of age. It is believed to become positive later in the infection, when dye test and complement fixation test fade.

3. *The Sabin-Feldman dye test.* This de-

pends on the ability of a Toxoplasma-immune serum to inhibit the staining with methylene blue of the cytoplasm of the living Toxoplasma. The test requires an accessory factor present in normal serum. It is a quantitative test, becomes positive early in the infection, rises during the active phases of the disease, and fades over years. Thus it is not only of diagnostic value but it is also somewhat indicative of the age and duration of the infection.

4. *The complement fixation test.* This depends on the ability of antibodies in an immune serum to bind complement in the presence of a Toxoplasma antigen. It is usually absent in the early stages of an active infection, becomes positive as the infection progresses, and, while it may last for years, disappears more rapidly than the dye test. Thus a developing and increasing complement fixation reaction is interpreted by some to be evidence of a present and active infection.

Relative value of the diagnostic tests

The neutralization test, with its wide margin of error, is of little value and is not generally used. Main reliance must therefore be placed on the dye test, the complement fixation reaction, and the cutaneous sensitivity tests.

In both experimental animals and the infected human, the dye test becomes positive early in the disease and increases in titer during the active phases of the disease. The complement fixation becomes positive later, persists for a considerable period, and then again becomes negative. It is therefore evident that the complement fixation test is of chief value when detected in the stage of development.

The toxoplasmin skin test becomes positive only very late in the disease, usually in the latent stage, and the sensitivity persists for years. A positive skin test is little more than an index of a possible former infection. The dye test, therefore, is our chief diagnostic aid.

The dye test is positive in a large number of apparently normal individuals. Thus in a survey of normal populations, Feldman[22] found the dye test positive in 70 of 144 residents of Pittsburgh and in 99 of 121 residents of Tahiti. It was positive in 280 of 682 scattered residents of the United States —most of the positive results being of low titers. Therefore, if the dye test is accepted as specific and indicative of a Toxoplasma infection, it is at once apparent that, at one time or another, a large segment of the normal population becomes infected with this parasite.

It has been argued that the dye test, especially in low titers, may not be specific. However, critics who entertain this opinion are unable to bring supporting evidence for their assertion. Positive reactions with serum from patients with other infections or cross-reactions with other immune serums have not as yet been demonstrated. Therefore, until such evidence is produced, a positive dye test must be regarded as indicative of a present or past Toxoplasma infection.

Since the dye test remains positive in low titers long after the disease is burned out and quiescent, what titers should be considered indicative of an active or recent infection? This question has been investigated in various countries and, in general, higher figures in the "normal" population have been obtained in America than in Europe.

This difference is probably due to the lack of standardization of the dye test. Beverley and Beattie[24] suggest that differences in the concentration of parasites in the antigen may be the responsible factor for these variations while Jacobs and Cook[23] suggest that it is related to the strain of Toxoplasma and the ratio of soluble antigen in the peritoneal exudate to the accessory factor.

Be this as it may, however, Sabin and his associates state that, with their technique, the majority of this normal population tested at random show low titers up to 1:64. As a result of their studies of the dye test in 598 normal individuals of various ages, Beverley

and Beattie suggest the following figures as significant.

Age	Titer
Under 10 years	1:16 or over
10-19 years	1:32 or over
Over 20 years	1:64 or over

An analysis of the results in the nongranulomatous group and nonuveitis controls reported in this paper, individuals in whom, with two exceptions, there was no possible reason to suspect a Toxoplasma etiology for the disease process, gives the following results:

Age	Percent	Titer
Under 10 years	100	Below 1:8
10-19 years	66	Below 1:32
20-29 years	66	Below 1:64
	86% below 1:256	
	91% below 1:256	
30-39 years	76	Below 1:64
40-49 years	80	Below 1:64
	90% below 1:256	
	96% below 1:256	

Material for study

For the past 10 years an etiologic study of uveitis has been a subject of major investigation in the Wilmer Institute. This study has been predicated on the belief (a) that uveitis can usually be classified clinically as nongranulomatous or as granulomatous, (b) that nongranulomatous uveitis is a hypersensitive reaction, (c) that granulomatous uveitis is caused by an actual invasion of the uveal tissue by the causative agent in living form.

In the etiologic study, each uveitis patient was subjected to a prolonged diagnostic survey. At the completion of this survey, whenever possible, a probable etiologic factor was ascribed to the uveitis. Thus granulomatous uveitis was classified as probably due to tuberculosis, syphilis, brucellosis, sarcoidosis, to a "miscellaneous group,"* and, in cases in which no clear etiology was apparent, as of "undetermined etiology."

As part of the diagnostic survey, blood was taken for various serologic tests and chemical determinations. When the survey had been completed, if there was any blood serum remaining, it has been our custom (since 1949) to store such remaining serum in the deep-freeze with the idea that at some future time some new test might be developed for which these serums would be useful.

When the question of adult-acquired ocular toxoplasmosis became acute, these various serums were all resurrected from the deep-freeze, the histories of the patients were examined, and the serums classified according to the clinical picture of the patient. Dye tests were then done on each of these individual serums (by L. J.). The technique of the dye test was that previously described by Sabin and Feldman in 1948 and 1952. When sufficient serum was available, complement fixation tests were done. Toxoplasmin skin tests had been done on a few patients in 1949, and were done routinely on all patients seen after December, 1952.

At the conclusion of the serologic studies, the histories of all cases giving positive dye tests were re-examined and the question of a possible or probable diagnosis of ocular toxoplasmosis was considered in the light of the dye-test results, the clinical picture shown by the patient, and the evidence revealed by the previous diagnostic survey.

There were available for this study 110 serums from patients who were classified as having nongranulomatous uveitis, 201 serums from patients who were classified as having granulomatous uveitis, and 98 serums from patients who had no uveitis and whose serums had been taken for study for a variety of obscure conditions. This last group was called "nonuveitis controls."

The original classification of the granulomatous uveitis group, in which any cases of ocular toxoplasmosis would fall, was as follows:

* The miscellaneous group included such conditions as Vogt-Koyanagi, syndrome, Behçet's syndrome, lymphogranuloma venereum, Harada's disease, herpes, and so forth.

Ascribed to	No. of cases
Congenital toxoplasmosis	10
Tuberculosis	45
Syphilis	15
Chronic brucellosis	14
Sarcoidosis	13
"Miscellaneous conditions"	26
"Undetermined etiology"	78

Results

The criteria here used for a "positive" test in the various age groups are:

Age	Titer
Below 10 years	1:8 or over*
10-19 years	1:32 or over
Over 20 years	1:64 or over

Proponents of the theory that toxoplasmosis is a frequent cause of uveitis may argue that these figures are too high, that unless lower titers are regarded as significant, many cases of ocular toxoplasmosis will be overlooked. Disbelievers in a Toxoplasma etiology for adult uveitis may argue that these figures are too low, that a large percentage of the "normal" population show titers of 1:64, and that, if titers of this level are regarded as significant, many cases of uveitis will incorrectly be attributed to toxoplasmosis. However, in the present state of knowledge, it would appear that titers of these levels in the different age groups are probably indicative of a Toxoplasma infection.

Whether the infection is old or recent must be estimated by the clinical picture of activity in the eye and, when possible, by repeated dye tests to detect a changing titer. Thus if titers of this level are interpreted in the light of the clinical picture and other findings revealed by the medical survey, a fair evaluation of the role of toxoplasmosis in adult uveitis can probably be obtained.

It is interesting that if the tables presented in this report were based on titers of 1:16, 1:64, and 1:128 in the various age groups, the conclusions drawn therefrom would be the same, although the percentage of positive tests would be somewhat smaller.

Table 1 shows the incidence of negative and positive dye tests at different ages in the nonuveitis control group, in the nongranulomatous, and the granulomatous uveitis groups. It is apparent that in the control and nongranulomatous groups, the incidence of positive tests is statistically the same at various ages. In these groups positive tests were not encountered in the first decade, began to appear in the second decade, reached a peak of about 33 percent in the third decade, and declined to 20 to 25 percent thereafter. In the granulomatous uveitis group there was a high incidence of positive tests in the first two decades (75 percent) and thereafter the incidence declined to between 35 and 45 percent.

Two cases in the nonuveitis control group deserve special mention. These patients were 15 and 25 years of age. Both had a classical picture of optic neuritis. The dye tests in these two patients were, respectively, 1:256 and 1:1,024. In one of these patients there

* The actual titers of the four positive reactions in the first decade were 1:8, 1:16, 1:64, and 1:512.

TABLE 1

Incidence of positive and negative reactions in different age groups in controls and nongranulomatous and granulomatous uveitis

Type of Case	0–10		10–19		20–29		30–39		40–49		Over 50	
	Neg.	Pos.	Neg.	Pos.	Neg.	Pos.	Neg.	Pos.	Neg.	Pos.	Neg.	Pos.
Controls	6	0	4	3*	12	3*	17	6	15	5	20	7
Nongranulomatous Uveitis	2	0	4	0	10	9	26	11	27	4	14	3
Granulomatous Uveitis	0	4	6	13	18	12	31	24	28	15	31	19

* One of these positives had optic neuritis, as well as positive skin tests. (See text.)

TABLE 2

CONSOLIDATED RESULTS OF POSITIVE AND NEGATIVE TESTS

Classification	Total Number	Pos.	Neg.
Nonuveitis Controls	98	24 25%	74 75%
Nongranulomatous Uveitis	110	27 25%	83 75%
Granulomatous Uveitis	201	87* 45%	114 55%

* Includes 10 cases of recognized congenital toxoplasmosis.

were no other physical findings. In the second case (dye test, 1:1,024 and complement fixation, plus four), the optic neuritis had followed an acute febrile illness, characterized by enlarged cervical glands and, on the basis of the blood picture, a diagnosis of infectious mononucleosis had been made.

With the recognized affinity of Toxoplasma for neural tissue and the close resemblance of adult symptomatic toxoplasmosis to infectious mononucleosis,[14, 15] the possibility is immediately suggested that the Toxoplasma infection in these two patients might be related to the optic neuritis, and that the second case might in truth have been an instance of adult symptomatic toxoplasmosis.

If other cases similar to these two are encountered, it would seem that our thinking on the etiology of optic neuritis would have to be revised and that toxoplasmosis would have to be considered a possible causative agent.

Table 2 gives the consolidated figures of negative and positive tests for all ages in the three groups of patients. It shows immediately the greatly increased incidence of positive tests in the granulomatous-uveitis group when compared to the other two groups—a 45-percent incidence against a 25-percent incidence. Not only was the incidence of positive titers greater in the granulomatous group, but the positive serums were also of higher titers. This is shown in Table 3.

In the combined control-nongranulomatous groups there were 51 serums with titers of 1:64 or over, and only 21 with titers of 1:256 or over. In the slightly smaller group of patients with granulomatous uveitis, there were 82 patients with titers of 1:64 or over and 40 patients with titers of 1:256 or over.

If toxoplasmosis is a cause of adult uveitis, these are exactly the results which would be expected. Clinically, ocular toxoplasmosis is essentially a granulomatous disease and Wilder's findings indicate the causative agent is present in the diseased ocular tissues, and the process is characterized by necrosis, tissue destruction, and repair by gliosis.

In nongranulomatous uveitis (with the exception of some acute late exacerbations in eyes with old granulomatous lesions, to be commented upon later), there is no reason to suspect any relation between a Toxoplasma infection and the ocular inflammation. Therefore, any positive titers found in the nongranulomatous-uveitis patients should be of the same incidence and intensity as in the control group. An increased incidence of positive titers and higher titers should be present in the group of granulom-

TABLE 3

INTENSITY OF DYE-TEST TITERS IN NONGRANULOMATOUS UVEITIS CONTROL AND NONGRANULOMATOUS UVEITIS GROUPS AND IN GRANULOMATOUS UVEITIS GROUP

Group	No. of Cases	Neg.	Pos. Undil. to 1:8	1:16–1:32	1:64–1:128	1:256–1:512	Over 1:512
Nonuveitis Control + Nongranulomatous Uveitis	208	87	45	25	30	12	9
Granulomatous Uveitis	201	49	32	38	42	27	13

TABLE 4

INCIDENCE OF NEGATIVE AND POSITIVE DYE TESTS IN 191 PATIENTS WITH GRANULOMATOUS UVEITIS OF APPARENT OR UNDETERMINED ETIOLOGY

Apparent Etiology Original Classification	No.	Neg.	Pos.	Reclassification of Positive Cases	
				Original Diagnosis Sustained	Reclassified a Possible Ocular Toxoplasmosis
Congenital Toxoplasmosis	10	0	10	10	0
Tuberculosis	45	32	13	12	1
Syphilis	15	10	5	3	2
Brucellosis	14	8	6	5	1
Sarcoidosis	13	9	4	3	1
Miscellaneous	26	21	5	4	1
Undetermined	78	34	44	2	42
TOTALS	201	114	87	39	48*

* Plus 10 cases originally diagnosed as total ocular toxoplasmosis = 58.

atous patients, in which ocular toxoplasmosis would fall.

Table 4 gives the distribution of the positive titers in the various subgroups of granulomatous uveitis, and shows one of the most interesting findings revealed by this study. In the 10 cases originally attributed to congenital toxoplasmosis, the dye tests were all positive, sustaining the original clinical diagnosis.

In the 113 patients, in whom, as a result of the original diagnostic study, the uveitis had been attributed to tuberculosis, syphilis, brucellosis, sarcoidosis, or to miscellaneous etiologies, the incidence of positive dye test was 30 percent, only slightly more than that found in the nonuveitis control and nongranulomatous control groups.

When the histories of the 33 positive reactors in these several groups were exhumed and reviewed, six cases were found in which the evidence on which the original diagnosis had been based was somewhat tenuous, and in which an equally good case could be made for a Toxoplasma etiology. In the remaining 27 cases, a critical review of the histories yielded no valid reason to question the original diagnosis, despite the late finding of a positive dye test.

Removing these six cases from their previous categories, the incidence of positive dye tests in these various granulomatous uveitis subgroups attributed to conventional etiologies was 23 percent. This is the same incidence found in the control and nongranulomatous groups. This is probably the margin of error—the incidence of unrelated positives—which must be considered in the interpretation of the dye test.

In the "undetermined-etiology" group of 78 patients, where the previous medical survey had revealed no definite etiologic factor to which the uveitis could logically be attributed, the situation was quite different. In this group there were 44 positive dye tests, an incidence of 56 percent. Further, eight of the 12 extremely high titers occurring in the granulomatous group, and all six of the dye titers rising on repeated tests, occurred in this subgroup of undetermined etiology. When the histories of these 44 patients were again critically examined, in 42 of them a diagnosis of ocular toxoplasmosis offered a plausible explanation for the uveitis.

Thus, in a series of 201 patients with granulomatous uveitis, when the results of the dye test were evaluated in relation to the ocular findings and the results of the medical survey, good reason was found to consider a Toxoplasma infection as the etiologic factor to incriminate in 58 of these patients —28 percent of the total. When the age of these 58 patients, any history of juvenile amblyopia, and associated suggestive findings

were considered, it appeared that in 17 of these patients the Toxoplasma infection was of congenital origin; while in 41, the onset of the ocular disease in adult life, the various Toxoplasma tests, and the associated findings all pointed to a late acquired infection.

In 10 of the 58 cases of probable toxoplasmosis, the probability of a congenital infection had previously been recognized, but in the 48 reclassified patients, such an etiology had previously not been suspected. In 42 of these latter patients, the previous medical survey had been unrevealing and the belated finding of significantly positive dye tests offered the first reasonable explanation for the uveitis.

If these findings are accepted as indicative of the etiology of the ocular disease, then in this series, the incidence of congenital toxoplasmosis as the etiologic factor is eight percent, and of acquired adult toxoplasmosis, 20 percent.

Re-examination of histories

A brief summary of the re-examination of the histories of the granulomatous uveitis patients giving positive dye tests (excluding the previously recognized 10 cases of congenital toxoplasmosis) is:

Tuberculosis

Thirteen of the 45 patients, originally classified as tuberculous uveitis, gave positive dye tests. In nine of these patients the titers were 1:64 to 1:128. In eight of these the evidence in favor of tuberculosis far outweighed the suggestion of a Toxoplasma etiology. In the ninth, the evidence for tuberculosis was somewhat tenuous.

This patient was 28 years of age, showed glial scars of an old choroiditis in one eye and recurrent vitreous hemorrhages with an area of periphlebitis in the second eye. There was a moderate hypersensitivity to tuberculin, and a few calcified glands in the mediastinum. He responded very slowly and rather poorly to specific antibiotic and chemotherapy. The dye test was positive 1:64 and the complement fixation and skin tests were strongly positive. Obviously, in the light of the previous findings, evidence for a Toxoplasma etiology was strong.

Of the remaining four patients, two (with dye test titers of 1:256 and 1:512 and good supporting evidence for a diagnosis of ocular tuberculosis) made prompt recoveries on specific antibiotic and chemotherapy, strongly suggesting ocular tuberculosis.

The third patient, with good evidence for the diagnosis of ocular tuberculosis, showed a dye test of 1:256, showed no change in the titer on two later tests over a six months' period, and had consistently negative complement fixation and skin tests. The last patient, 60 years of age, with a dye test of 1:1,024 and a negative complement fixation test, had what appeared to be a clear-cut generalized tuberculous uveitis of one year's duration and, despite the high dye test, the original diagnosis appeared valid.

Syphilis

Five patients with syphilis showed positive dye tests. Two of these patients (with dye tests of 1:64 and 1:1,024) had what appeared to be a diffuse syphilitic choroiditis (Forster). The third with an original dye test of 1:128, showed a negative dye test one year later.

The fourth patient, 37 years of age, with an active "focal" choroiditis, had a dye test of 1:64, a negative complement fixation test, and a plus-two skin test. The fifth patient, 48 years of age, with asymptomatic neurosyphilis and retinal periphlebitis with recurrent vitreous hemorrhages, had a dye test of 1:64, a weakly positive complement fixation test, and a plus-three skin test.

These last two patients showed ocular lesions doubtfully attributable to their syphilitic infections, and the actual cause of their ocular disease may well have been the Toxoplasma infection.

Brucellosis

Six patients in the brucellosis subgroup gave positive dye tests. In four of these the titer was 1:64, and the one patient so tested had a positive toxoplasmin test. Two of these patients had an active choroiditis and two a generalized uveitis. In all four the history of exposure to brucellosis, positive agglutination tests, and marked hypersensitivity to brucellin and brucellergin pointed more to a Brucella etiology than to toxoplasmosis.

The fifth, a 36-year-old farm woman, had a recurrent uveitis of five years' duration, a suggestive history, and strongly positive Brucella tests. There was little doubt that this patient had chronic brucellosis. Although she gave a positive dye test of 1:256, the clinical picture pointed more to brucellosis than toxoplasmosis.

The sixth patient, also a farm woman, had an acute central focal choroiditis. She gave strongly positive Brucella tests and made a prompt, almost too prompt, recovery on aureomycin therapy. She had an original dye test of 1:1,028, which was repeated three times over one year and remained unchanged. She likewise had plus-four complement fixation and skin tests. Despite the history and positive Brucella tests, the clinical picture and course of the disease probably fit in better with toxoplasmosis than brucellosis.

TABLE 5

DISTRIBUTION OF POSITIVE TITERS IN UNDETERMINED GROUP

Titer	No. of Cases	Remarks
Low Titers (up to 1:64) one result only)	15	3 cases of probable congenital toxoplasmosis 6 cases of "focal" choroiditis 1 case of disseminated choroiditis 3 cases of generalized uveitis 1 case of anterior granulomatous uveitis 1 unclassified
Moderate Titers (1:128–1:256) one result only	15	3 cases of probable congenital toxoplasmosis 5 cases of "focal" choroiditis 1 case of disseminated choroiditis 3 cases of generalized uveitis 3 cases of periphlebitis retinae
High Titers (1:512–1:16,324) one result only	8	6 cases of "focal" choroiditis 2 cases of generalized uveitis
Rising Titers on Repeat Test (up to 1:16,384)	6	1 case of probable congenital toxoplasmosis—Late exacerbation at the age of 33 yr. 4 cases of "focal" choroiditis 1 case of generalized uveitis

SARCOIDOSIS

Four patients in the sarcoidosis group gave positive dye tests. In three, with titers of 1:64, 1:64, and 1:128, the ocular picture was typical of sarcoidosis and the diagnosis was confirmed by gland biopsy. Obviously, in these patients the positive dye tests should be disregarded.

The fourth patient showed the peculiar preretinal nodules so often seen in sarcoidosis. However, there were no other evidences of the disease and a gland biopsy was negative. The dye test was positive 1:256, and was the only other positive finding. A Toxoplasma etiology must be considered as remotely possible in this case.

MISCELLANEOUS GROUP

Five patients in this group gave positive dye tests. Two can be immediately disregarded. One of these, with a dye test of 1:64, had a clear-cut metaherpetic kerato-uveitis. The second, with an original test of 1:128 and titers of 1:64 on two repeat tests, had a classical Vogt-Koyanagi syndrome.

Two of the patients showing positive dye tests had what was believed to be a Histoplasma uveitis. This diagnosis was based on anergy to tuberculin, pulmonary calcification, a violent hypersensitivity to histoplasmin, and an otherwise completely negative survey. The dye tests in these patients were positive 1:64 and 1:128. The possibility of cross-fixation with an antihistoplasma serum in these cases appears remote, for there were five other similar cases in this "miscellaneous" group of which all gave negative Toxoplasma tests. It seems probable the positive dye tests in these patients were without significance.

The fifth positive patient in this subgroup may possibly present a case of ocular toxoplasmosis. This 42-year-old man showed the confused ocular picture of a generalized uveitis with a secondary inflammatory detachment of the retina. There was a history of recurrent herpes. The medical survey was entirely negative. The possibility of Harada's disease was considered. The dye test was positive 1:512. It is unfortunate that efforts to locate this patient for further study have been unsuccessful.

UNDETERMINED ETIOLOGY

There were 44 positive dye tests in the 78 patients in whom the previous medical survey had revealed no etiologic factors for the uveitis. The distribution of these positive dye tests is shown in Table 5. Fifteen had low titers of 1:64. Fifteen had moderate titers of 1:128 or 1:256. Eight patients had high titers of 1:512 to 1:16,384. Six had rising titers on repeated tests, the minimum being a rise from 1:64 and 1:512 and the maximum from 1:1,024 and 1:16,384.

Seven of these patients probably had congenital toxoplasmosis. Such a diagnosis had not been suspected on the original examination and study. However, when this possibility was suggested by the belated finding of positive dye tests it became evident that congenital toxoplasmosis was the probable correct diagnosis.

Five of these seven patients were under 15 years of age. All had either a history of infantile amblyopia in one eye or showed old glial scars in the fundi. In all, the medical survey had been completely negative. All five had had recent acute exacerbations, and in three the clinical picture fitted well with Frenkel's hypothesis of a pseudocyst rupturing into sensitized tissue.

The sixth of these patients was 33 years of age. One eye had been blind since birth, had recently undergone an acute exacerbation, had gone into phthisis, and was enucleated. Cultures and animal

inoculations of one half of this eye were negative but most unfortunately, the inoculated animals were killed after three weeks, an insufficient time to establish a negative diagnosis of toxoplasmosis.[12] The histologic diagnosis on the other half of this enucleated eye was chronic granulomatous uveitis. Repeated dye tests on this patient were positive 1:4,096. Further histologic studies, searching for Toxoplasma, are now in progress.

The seventh of the probable cases of congenital toxoplasmosis was that of a man, aged 65 years, blind since infancy. The medical survey was entirely negative. The fundi showed extensive glial scars. The dye test was positive 1:256.

Twenty-one of the positive dye tests in this undetermined-etiology subgroup had what might be called a "focal" choroiditis, with either single or multiple discrete circumscribed exudative lesions or glial scars. Twelve of these patients had titers of from 1:64 to 1:256, six had high titers from 1:512 to 1:16,384 on single examinations, and five had titers rising as high as 1:16,384 on repeated tests. Complement fixation tests were done on 10 of these 21 patients, eight being positive plus two to plus four, and two being negative. Skin tests with toxoplasmin were done in seven instances and all were positive.

All of these patients had focal chorioretinal lesions which, on clinical examination, could be considered similar to the lesions described by Wilder in which she found Toxoplasma. In the absence of any other discoverable cause, all 21 of these patients must be regarded as showing probable examples of acquired adult toxoplasmosis. However, on the evidence at hand, the diagnosis of ocular toxoplasmosis cannot be limited to these cases of focal choroiditis.

In this group, there are nine cases of generalized granulomatous uveitis and two cases of disseminated choroiditis which may with equal reason be attributed to toxoplasmosis. These patients had positive dye tests from 1:64 to 1:16, 384; in one, the dye test rose from 1:1,024 to 1:16,384 on repeated tests.

In two of these 11 patients complement fixation and skin tests had been done. All were strongly positive. Moreover, in this undetermined etiology subgroup there were three patients with retinal periphlebitis and vitreous hemorrhages. The dye tests were positive—1:128 in two instances and 1:256 in the third. None of these three patients showed any evidence of tuberculosis.

In view of Rieger's[11] previous suggestion that toxoplasmosis is a possible cause of retinal periphlebitis and of the two such cases already mentioned in this report, a Toxoplasma etiology must be suspected in these three cases.

The last two of these 44 positive dye tests in the undetermined-etiology subgroup defy classification. In one the clinical diagnosis lay between nongranulomatous and granulomatous uveitis, being finally classified in the latter group. In this patient the dye test was 1:64 and the complement fixation reaction four plus.

The last patient was a veritable reservoir of pathologic possibilities, the original diagnosis lying between tuberculosis, histoplasmosis, and brucellosis, with some evidence in favor of all three. He was finally classed as having a case of undetermined etiology. The dye test in this individual was positive 1:64, and toxoplasmosis is therefore entitled to compete with these other conditions for nomination as the etiologic factor.

Comment

There are obvious deficiencies in this study. These are:

1. The majority of the sera were old, and the patients were scattered far and wide, making it impossible to reassemble them for re-evaluation of their condition.

2. Contemporaneous complement fixation reactions and skin tests were done on only a very few of the older patients, and not routinely until December, 1952.

3. Many of the old sera were anticomplementary and often the quantity of serum available was insufficient for both the dye test and the complement fixation test.

4. Repeated dye tests to detect a changing titer were done on only a small number of the positive serums—those examined during the past year when our attention was specifically directed to the question of toxoplasmosis.

The age of the serums, however, in no way invalidates the accuracy of the dye tests. The modifying antibody is thermostabile and fortunately the serums were all stored in the deep-freeze without a preservative, which would have made them unfit to use. The dye test results are therefore accurate and permit the drawing of valid conclusions.

While the value of repeated dye tests and the significance of changing titers is fully admitted, nevertheless it is probable that such a procedure will prove impractical in the majority of the cases. Unsatisfactory as it may be, the average ophthalmologist will usually have to draw his conclusions as to the importance of toxoplasmosis as an etiologic factor in uveitis from a single set of observations. The reason for this is that there are few laboratories where this test is done, the majority of the patients are re-

ferred to these central points for consultation, and are available for a short period only. Despite these obvious defects, this study gives a good picture of the role of Toxoplasma infection in granulomatous uveitis, *provided two cardinal premises are accepted*. The cardinal premises are:

1. The bodies found by Wilder in the chorioretinal lesions are true Toxoplasma infections and are the actual cause of the chorioretinal lesions.

2. The dye test in the dilutions here regarded as significant is specific for toxoplasmosis, and positive tests are indicative of a present active or of an old latent infection.

As concerns the first premise, it is almost universally admitted that the bodies described by Wilder are morphologically identical with Toxoplasma and, if their identity is so admitted, they are in all probability the actual cause of the lesions. Until such time when Toxoplasma are recovered from an enucleated eye by animal inoculation and their living nature proven, their identity will not be unequivocally established.

As concerns the second point, there is no present evidence that the dye test is not specific. It is positive regularly in experimental animals and known infected infants, and positive tests of any significant degree have not been found in other protozoan or yeast infections. Until such time as evidence to the contrary is presented, the dye test must be accepted as specific for Toxoplasma infection.

Based on these two premises and subject to revision if these premises later are proved erroneous, the statistical studies presented in this report justify the following broad conclusions and comment.

A. Toxoplasmosis in the adult is a widespread and extremely common infection. As a general rule, the infected individuals are entirely asymptomatic. Only occasionally does an infected adult show any systemic evidence of infection. The eyes, however, appear to be definitely more susceptible to symptomatic toxoplasmosis than do the other tissues of the body. This may be due either to a special affinity of the parasite for ocular tissues or to the fact that, when minute lesions occur in the eye, they produce physiologic changes out of all proportion to the size of the lesions. Thus lesions, which in the viscera would cause no symptoms, would pass unnoticed and be impossible of detection, assume major importance when they occur in the eye.

B. A clinical diagnosis of ocular toxoplasmosis is only justified when the following three criteria are fulfilled:

1. The eyes show either the glial scars of old granulomatous lesions, or active granulomatous uveal lesions, or possibly a periphlebitis retinae.
2. A careful medical survey has revealed no evidence of other granulomatous disease to which the ocular lesions may logically be attributed. If any patient with a granulomatous uveitis should show evidence of another systemic granulomatous disease and at the same time show positive tests for toxoplasmosis, the question is then one of differential diagnosis.

In the series here reported, this dilemma was encountered 33 times in 113 cases of granulomatous uveitis (table 4). Yet, when each history was critically re-examined and all factors, including the positive dye tests, were carefully weighed, in only six instances did there seem reason to question the original diagnosis which attributed the ocular disease to recognized conventional etiologies. In the main, the differential diagnosis should not be too difficult. It is of more than passing interest that there were positive dye tests in 44 of 78 cases in which no conventional etiology was suggested by the medical survey and that in 42 of these, the positive Toxoplasma tests appeared to give the correct answer.

3. The patient gives serologic or cutaneous reactions indicative of a Toxoplasma infection. The dye test must always be positive, the complement fixation and

skin tests may be either positive or negative.

In this series, the number of serums from patients who had simultaneous dye, complement fixation, and skin tests was insufficient to permit any specific conclusions on the diagnostic significance of various combinations of positive and negative results with these three tests.

A survey of the material available indicates that in old, quiescent cases of probable ocular toxoplasmosis the dye test was usually of moderate titer (1:64-1:256). The complement fixation test was usually positive, but occasionally was negative. The skin test was usually positive. In active cases, especially those of some duration, the dye test tended to be high (1:512 or over), the complement fixation test was either positive or negative and, more often than not, the skin test was negative.

The most important indications for a Toxoplasma etiology in a granulomatous uveitis are undoubtedly either a very high titer dye test, a dye test titer which rises on repeated examinations, or a complement fixation test, originally negative, which becomes positive during the course of the disease. These observations appear to be in line with those of other students in this field.

It is incorrect, however, always to interpret a high-titer dye test as positive evidence of a Toxoplasma etiology in granulomatous uveitis. While the dye test tends to be high in the active stages of the disease, nevertheless, as this study shows, high titers of 1:512 to 1:2,056 may occasionally be found in individuals in whom ocular toxoplasmosis cannot be suspected. In this series, nine such high titers were found in the 208 individuals in the nonuveitis control and the nongranulomatous uveitis groups.

Accepting the conclusion that previous investigations and the material presented in this report support the idea that an acquired Toxoplasma infection may produce adult ocular disease, what are the clinical ocular lesions under which the disease may parade?

The most frequent finding in the cases herein classified as ocular toxoplasmosis is undoubtedly a "focal" choroiditis. In the undetermined-etiology subgroup there were 21 patients with such chorioretinal lesions. When all the various other subgroups of granulomatous uveitis were surveyed, there were 22 other cases of "focal" choroiditis with positive dye tests in which the diagnosis of ocular toxoplasmosis appeared to be justified.

Thus, of the 58 patients in the entire granulomatous-uveitis group in whom a Toxoplasma infection appeared to be the probable cause of the disease, 43 had what is often called "focal" choroiditis, either manifested by discrete pigmented glial scars or by circumscribed exudative lesions.

Yet it would be grossly incorrect to attribute all cases of focal choroiditis to toxoplasmosis. In this series, although 43 cases of focal choroiditis are finally attributed to toxoplasmosis, there are also 32 cases of typical "focal" choroiditis in which the Toxoplasma dye tests were negative. From the clinical viewpoint, a focal choroidal lesion is suggestive, but far from indicative, of a Toxoplasma etiology.

There were 10 cases of generalized granulomatous uveitis and five cases of retinal periphlebitis with secondary vitreous hemorrhages in the 58 cases attributed to Toxoplasma infection. In all of these there was equal reason to incriminate toxoplasmosis. Also to be remembered are the two cases of optic neuritis in the control nonuveitis series, both of which might well have a Toxoplasma etiology.

One other clinical finding must be mentioned. In the 17 cases in which either an early or late diagnosis of congenital ocular toxoplasmosis had been made, there were three cases which presented a peculiar picture. These patients all had a history of infantile or juvenile amblyopia in the affected eye, heavy discrete glial scars of an old choroiditis, positive dye tests, and negative medical surveys.

All had late acute exacerbations, characterized by diffuse subretinal edema, blurring of the vitreous, and loss of fundus details. The attacks ran a short course and subsided, leaving extensive retinal degeneration. The general picture was that of an acute nongranulomatous reaction superimposed on an old granulomatous process. Frenkel's suggestion that such lesions are caused by the rupture of a pseudocyst in sensitized tissue offers a logical explanation for the picture.

In summary, judging from the evidence in this series, ocular toxoplasmosis may appear in various guises. The most frequent is focal choroiditis, next generalized granulomatous uveitis. Retinal periphlebitis with secondary vitreous hemorrhages may occasionally be due to toxoplasmosis, as may acute nongranulomatous inflammations of the posterior uvea in patients who show evidences of old granulomatous fundus disease. There is a possibility that some cases of optic neuritis may also be due to a Toxoplasma etiology.

One further technical point deserves comment—whether or not a toxoplasmin skin test would, in itself, produce any change in the titer of the dye test. Frenkel has reported that a rise occurs in the dye test titer.[26] It has long been known that skin tests with brucellin or brucellergin may profoundly alter the titer of subsequent Brucella agglutination tests. It is, therefore, within the realm of possibility that some such alteration might be produced by the toxoplasmin test. To investigate this point, in a number of patients, blood was drawn for the dye test prior to the toxoplasmin test, and again five days after the test. The titers of the per- and post-toxoplasmin tests were always the same. It seems clear therefore that toxoplasmin tests may be done in a patient without fear of affecting the future reliability of the dye test.

Summary

This investigation was undertaken to determine whether a dye-test study of the serums of a large number of well-studied and classified cases of nongranulomatous and granulomatous uveitis patients would shed any light on the highly controversial question of the existence of adult-acquired ocular toxoplasmosis as a clinical entity.

The study has yielded considerable circumstantial evidence that a Toxoplasma etiology can reasonably be ascribed to a large percentage of cases of granulomatous uveitis —in this series 58 out of a total of 201 cases. Seventeen of these cases were probably congenitally acquired infections and 41 were probably due to adult infections.

The circumstantial evidence deduced from this study may be summarized as follows:

1. In the nonuveitis control group and nongranulomatous uveitis group, where there is no thought of a Toxoplasma infection being related to any ocular disease, there is about a 25-percent incidence of positive dye test.

2. In the granulomatous uveitis group, in which any possible Toxoplasma ocular disease would fall, there was a statistically significantly higher percentage of dye tests—45 percent.

3. In the granulomatous uveitis group the positive dye tests were generally higher than in the other group. Further, all cases of rising titer on repeated tests were encountered in the granulomatous group of patients.

4. A study of the distribution of the positive dye tests in the various etiologic subgroups, a classification determined as a result of a previous thorough medical survey of each individual patient, showed the following:

a. The incidence of positive tests in the subgroups attributed to recognized conventional etiologies was essentially the same as in the control group and in nongranulomatous-uveitis patients—around 25 percent.

b. The greatest number of positive tests occurred in the group of "undetermined etiology," where the previous medical survey had failed to reveal any etiologic factor to

which the ocular disease could logically be attributed. The incidence of positive dye tests in this group was 56 percent.

5. A critical review of the histories of patients with granulomatous uveitis and who showed a positive dye test gave the following information:

a. In the various subgroups previously attributed to conventional etiologies, there were six cases in which a fair argument could be made for a Toxoplasma etiology instead of the original granulomatous disease to which the etiology had been attributed.

b. In the remaining 27 cases, previously attributed to conventional causes, no reason was found to alter the original etiologic diagnosis.

In the subgroup in which no etiologic factor had previously been determined there were 44 patients with positive dye tests. In 42 of these, a Toxoplasma infection offered a reasonable explanation for the uveitis.

6. An over-all view of the probable or possible Toxoplasma etiology in the granulomatous uveitis cases showed that the incidence of such probable or possible etiology was approximately 28 percent, 58 in 201 such patients.

7. The most frequent ocular lesions in those patients whose ocular disease was attributed to a Toxoplasma etiology was a so-called "focal" choroiditis. There were, however, an appreciable number of cases of generalized granulomatous uveitis and retinal periphlebitis to which, with equal justice, a Toxoplasma etiology could be attributed. There were two cases of straight optic neuritis in which such an etiology could be suspected.

8. The cases of active uveitis attributed to toxoplasmosis frequently showed high dye-test titers and, in cases in which the dye test was repeated, rising titers were consistently shown. The occurrence of positive complement fixation reaction and positive skin tests was sometimes variable. For technical reasons, it is doubtful if repeated dye tests will be a practical procedure in the average patient.

Conclusions

Subject to fallacies in the two accepted premises—that the bodies found by Helenor Wilder in chorioretinitis cases are true Toxoplasma parasites and that the titers used here for a positive dye test are a reliable specific indication of a Toxoplasma infection—this study permits the following conclusions:

1. Adult-acquired ocular toxoplasmosis is an actual clinical entity.

2. A Toxoplasma infection is the probable etiologic factor in approximately 25 percent of adult granulomatous uveal disease.

3. The diagnosis of a Toxoplasma infection can only be made by a careful consideration of the clinical ocular picture and by an evaluation of the results of a careful medical survey and of the serologic and cutaneous Toxoplasma tests.

4. When a single positive dye test is the basis for a Toxoplasma diagnosis, there appears to be a 20 to 25 percent margin of error.

The Johns Hopkins Hospital (5).

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RETRACTION NYSTAGMUS: A CASE REPORT*

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CASE REPORT

HISTORY

A boy, aged 16 years, presented a peculiar and rare type of nystagmus. He was first seen by us in a semistuporous state, but could be aroused and responded slowly and in detached manner to requests or commands during the examinations although he would not answer questions or voluntarily speak.

We were told that a month prior to our examinations the patient complained of difficulty in seeing and severe frontal headaches. Neither of these complaints was constant. There were apparently no other disturbances. It was not determined if diplopia, reduced visual acuity, or loss of visual field was the cause of the alleged difficulty in seeing.

EXAMINATION

Our examination revealed nystagmus of irregular type and varying frequency and amplitude which occurred in bursts or paroxysms. With the amplification and acceleration of the nystagmus, both globes retracted into the orbits and the lids closed over them perceptibly narrowing the palpebral spaces (fig. 1). These retractions seemed to be instigated by attempted upward gaze or convergence which seemed to act as

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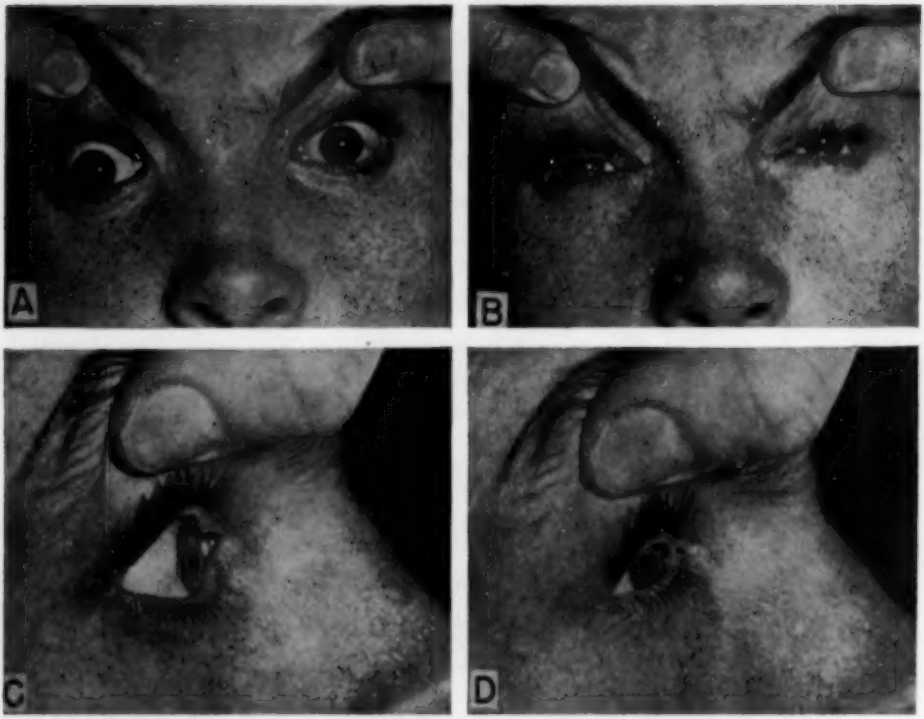

Fig. 1 (Lyle and Mayfield). (A and C). Position of eyes between bouts of retraction nystagmus. (B and D). Position of eyes during bout of retraction nystagmus.

a trigger mechanism in producing the retraction.

Command or request movements showed definite loss of upward gaze with both eyes. Following movements were apparently normal in all directions including upward gaze. Eye movements though present were executed in an inco-ordinated, inconjugate or disjunctive manner.

Version, vergence, and duction tests were questionably accurate as the responses of the patient were not dependable. Convergence appeared poor. Upon convergence the nystagmus (quick component) was toward the nose with both eyes. As already stated, this action seemed to instigate the acceleration of nystagmus and result in retraction of the globes.

Pupils were round, equal in size, and reacted very poorly, if at all, to light both directly and consensually. Media were clear. Bilateral papilledema of considerable degree was present, about equally in both eyes. Aside from venous engorgement, the remaining fundus appeared normal in each eye.

Because of the patient's mental condition, visual acuity and visual fields could not be determined. Optokinetic nystagmus tests were inconclusive. No nystagmus was noted with the rotating drum, possibly because of the poor visual attention of the patient. Induced caloric vestibular nystagmus definitely influenced the existing spontaneous nystagmus but no interpretation of the tests was considered feasible.

Electro-encephalograms

Electro-encephalograms were made and reported "the characteristic pattern presents irregular moderate and variable amplitude 12

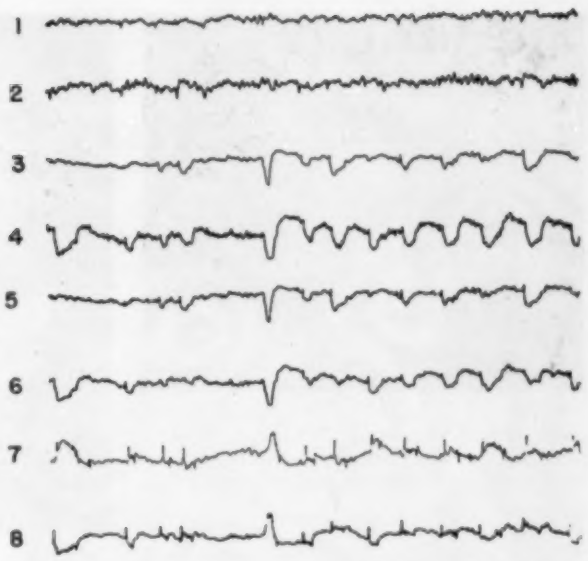

Fig. 2 (Lyle and Mayfield): (1 and 2) Electroencephalogram—right and left occipital lobes. (3 and 4) Electromyogram—right and left eyebrows. (5 and 6) Electromyogram—right and left outer canthi. (7 and 8) Electromyogram—right and left lower lids.

to 14 per second waves, sequences of 5 to 7 per second waves and short bursts of 10 per second alpha rhythm. Moderate amplitude sharp waves occur in all fields. Summary: Diffusely abnormal electro-encephalogram. No significant localizing phenomena are noted."

Electromyograms of the eye movements were registered with electro-encephalographs. Electrodes were placed above, below, and lateral to each eye. The report was "moderately high potentials of 18 to 20 per second occur with superimposed electro-encephalogram activity when the eyes are closed. With eyes open the electro-encephalogram muscle potentials are more pronounced and of higher voltage. All are in phase. The phase, rate and contour of the waves remain the same when eyes are moved in all directions. The potentials are frequently spiky in type."

The waves in this case are seen to be of variable amplitude, frequency and contour (fig. 2) and are in contrast to the regular sharp elevation and declining plateau of vestibular and induced optokinetic nystagmus which show a quick and slow phase. The waves in this case are even more irregular in amplitude and frequency than the waves of spontaneous ocular nystagmus. Their classification as either ocular or vestibular type seems impossible.

Ventriculograms show symmetric dilatation of lateral ventricles and the anterior part of the third ventricle (figs. 3A and 3B). The posterior part of the third ventricle, aqueduct of Sylvius, and fourth ventricle are not visualized. A tumor mass containing minute flecks of calcium is apparent in the posterior portion of the third ventricle.

Operation

Operation, approaching through the posterior part of the corpus callosum, revealed a malignant pinealoma which filled the posterior third of the third ventricle and extended through the aqueduct of Sylvius to the fourth ventricle. The aqueduct was dilated and filled with the mass. The hypothalamus and structures of the midbrain were compressed.

Postmortem findings

The patient died the day following operation.

Gross sections of the brain revealed the location and extent of the tumor (fig. 4).

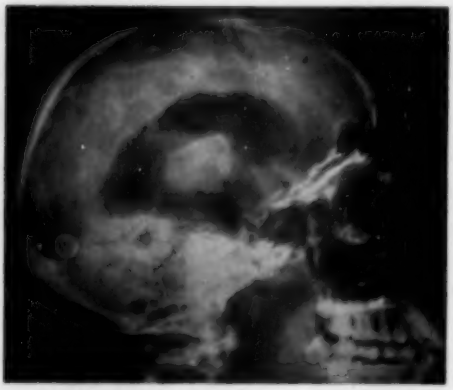

Fig. 3A (Lyle and Mayfield). Lateral ventriculogram showing dilated laterals and anterior third ventricle. Posterior third ventricle, aqueduct of Sylvius and fourth ventricle not visualized.

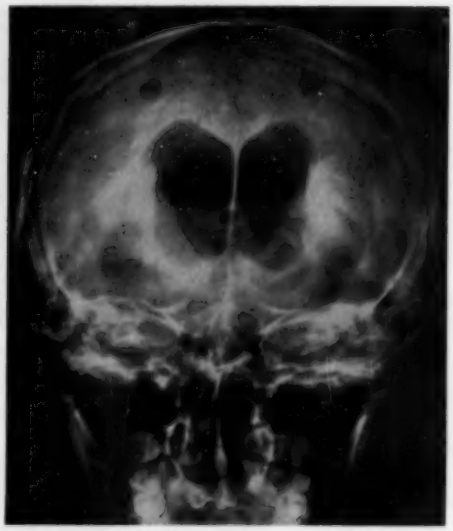

Fig. 3B (Lyle and Mayfield). Frontal ventriculogram showing dilated lateral ventricles without lateral displacement.

Microscopic sections of the involved area have been made and will be reported in detail by Vonderahe at a future time. These sections show the tumor extending through the entire aqueduct of Sylvius which it has dilated and filled completely (fig. 5). The tumor has also invaded the gray matter and, by extension and compression, has damaged or destroyed the oculomotor and trochlear nuclei and the median longitudinal fasciculus on both sides. Other structures not pertinent to this discussion were also implicated. Postoperative hemmorrhage is also evident in both the gross and microscopic sections.

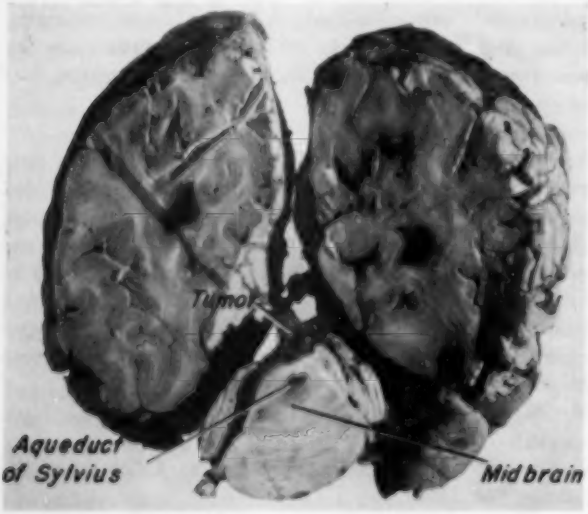

Fig. 4 (Lyle and Mayfield). Cross brain section of hemispheres, pineal area, and midbrain, showing involvement from pineal tumor.

Discussion

Approximately 20 cases of nystagmus retractorius have been reported—all from Europe (references). The first case was described by Koerber[1] in 1903. The early cases appeared to be medical, not surgical, so that direct localization and character of lesion were precluded since operative, and also postmortem, exposure was not obtained. In these cases, encephalitis of toxic or infectious nature, syphilis, multiple sclerosis and posttraumatic hemorrhage or sclerosis were thought to be etiologic factors.

Salus,[2] in 1911, reported the first postmortem examination

which revealed an echinococcus cyst extending from the fourth ventricle through the aqueduct of Sylvius into the third ventricle. Elschnig,[4] in 1913, reported the second autopsy, an ependymoma of the wall of the third ventricle occluding the aqueduct of Sylvius. He explained the mechanism of the production of retraction of the globes as the result of nervous impulses which, unable to reach their goal, produced mass innervation of the whole area occupied by the nuclei of the nerves of the eye muscles.

Subsequent reports were of various tumors of the midbrain, hypothalamus, and pineal gland or of the third or fourth ventricles with extension into the aqueduct of Sylvius. Later, a series of five cases of brucellosis or undulant fever called by the authors, Bang's disease, appeared in the literature, Heim,[17] in 1945, described one of these cases and reviewed all of the preceding reported cases of nystagmus retractorius. Since then, three additional cases have been reported.

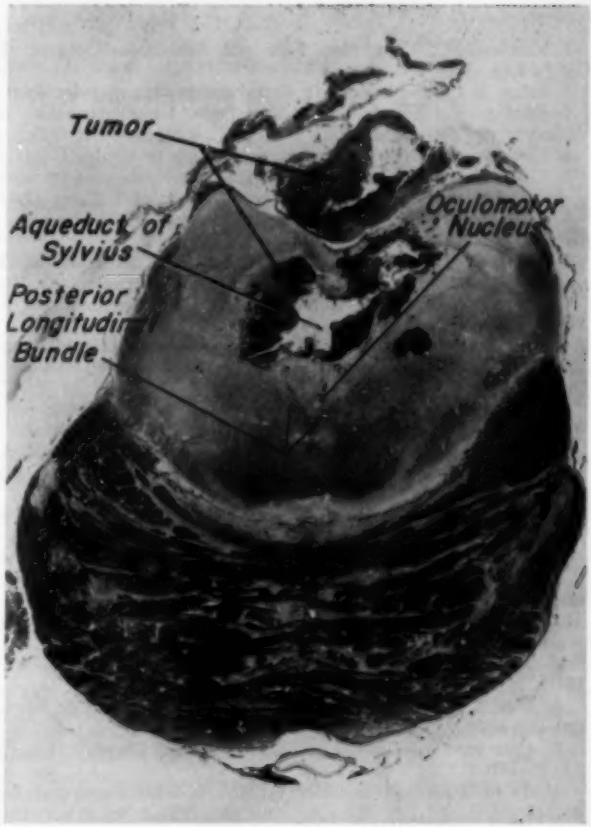

Fig. 5 (Lyle and Mayfield). Section through aqueduct of Sylvius of midbrain showing areas of destruction by tumor.

Summary

Retraction nystagmus is found in lesions of various types, chiefly neoplastic or inflammatory, involving the region of the aqueduct of Sylvius of the midbrain and implicating the oculomotor and trochlear nuclei and possibly their immediate supranuclear fibers as well as the median longitudinal fasciculus and its midbrain nuclei. All of these structures are located in or adjacent to the white matter surrounding the aqueduct of Sylvius.

The constant symptoms which may be included in a syndrome are, in addition to retraction of the globes, paralysis of upward gaze, convergence paralysis or paresis, loss of pupillary light reflex, and incoordination of eye movements with irregular nystagmus.

601 Union Trust Building (2).

The following references probably comprise a complete bibliography of the reported cases of retraction nystagmus in the literature to date. They consist of one-third, seven cases, of encephalitis chiefly due to brucellosis, one-third, eight cases, of neoplasm in the upper brain stem area, five cases in which the etiology was not specified or not known and one each of the following: ecchinococcus cyst, multiple sclerosis, syphilis, and trauma.

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Ophthalmic Miniature

I have been, from the earliest part of my professional career, an industrious note-taker, and from time to time I have given both myself and my friends much trouble in the endeavour to make my cases complete. The latter have in many instances very kindly spared no pains to obtain for me the final results in cases of which the first notes had been taken years before.

Jonathan Hutchinson
Preface, *Archives Surgery*, 1, 1890.

ALPHA IRRADIATION*

Effect of astatine on the anterior segment and on an epithelial cyst

Robert N. Shaffer, M.D.
San Francisco, California

In the unfolding drama of the atomic age, the lethal aspects of nuclear fission have tended to hold the center of the stage. However, in scientific laboratories, a vast amount of new knowledge is being accumulated. Physiologic processes are being investigated by radioactive and stable isotopes. Blood dyscrasias, cancer, and hyperthyroidism have been found to respond to radioactive materials injected into the affected patient. Ophthalmologically, most of the investigations have centered on beta or neutron irradiation. No data have as yet been published on the ocular effects of alpha irradiation.

The present interest in alpha irradiation was aroused by the search for more effective therapy of epithelial cysts in the anterior chamber. Such a cyst had been found in a patient one year after a cataract extraction. This cyst (fig. 1) had an extension along the trabeculum which could be seen only gonioscopically (color plate, fig. a).

In addition to the immediate hazards of the surgery and the fair possibility of recurrence, surgical removal would have required an excision of a full third of the iris. Sclerosing solutions and X-ray therapy seemed to offer no better prognosis.

In consultation with two radiobiologists, Joseph G. Hamilton, M.D., and Kenneth G. Scott, Ph.D., of the University of California, it was thought that alpha irradiation might prove to be the ideal agent for dealing with such a thin-walled structure.

Nature of alpha particles

An alpha particle is the helium nucleus, $_2He^4$, made up of two protons and two neutrons, the latter being the uncharged counterpart of the positively charged proton plus an

* From the Division of Ophthalmology, University of California School of Medicine. This research was partially financed through the generosity of Mrs. E. S. Heller. Candidate's thesis presented toward membership in the American Ophthalmological Society and accepted by the Committee on Theses.

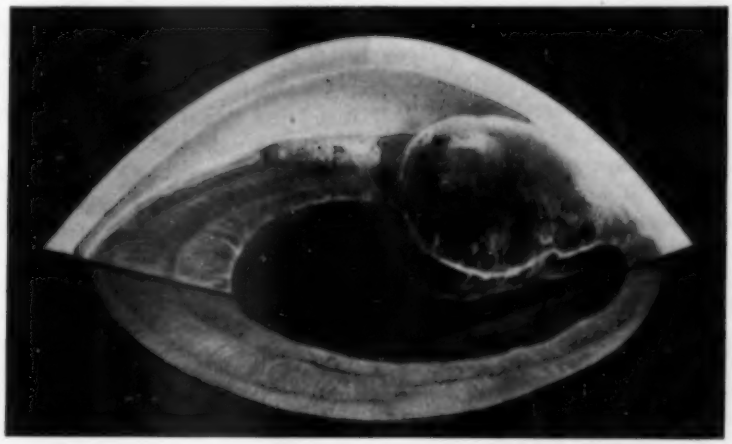

Fig. 1 (Shaffer). Anterior chamber cyst in gonioscopic view, showing extension of cyst along the angle wall.

electron. Its mass is 2,000 times that of a beta particle. Because of its size and doubly positive charge, it is slowed and stopped in 100 micra of tissue. It moves in a straight line, producing an intense electrostatic interaction with the electrons in the tissue, yielding excited particles and neutral helium.

An average alpha particle will give off 6,000,000 or 7,000,000 electron volts of energy in 100 micra of tissue, while an average beta ray by comparison will give off only 200,000 electron volts in 2,000 micra of tissue.

Bombardment by alpha particles should deliver sufficient energy to destroy a thin-walled epithelial cyst. Its limited penetration should prevent serious damage to contiguous normal structures. The element $_{85}$astatine^{211} was chosen as the best source of alpha particles.

Nature of astatine

It will be recalled in the periodic table of the elements that hydrogen, $_{1}H^{1}$, is element No. 1, and uranium, $_{92}Ur^{235}$, is element No. 92. The hydrogen nucleus is made up of one positively charged particle, a proton, and has a mass number of 1. Uranium has a mass number of 235, its nucleus having 92 protons plus 143 neutrons.

Radioactivity in an element is produced by an unstable relationship between protons and neutrons in the nucleus. The emission of radioactive particles accompanies the reshuffling of protons and neutrons when the element is decaying to a more stable form.

Astatine, $_{85}At^{211}$, is element 85, and has 85 protons and 126 neutrons in its nucleus, giving a mass number of 211. This element is unstable and decays so promptly that it is not found at all in nature. The astatine used in this experiment was manufactured in the 60-inch cyclotron of Crocker Laboratory by bombarding a bismuth target with 29 mev (million electron volts) alpha particles according to the following formula:

$$_{83}Bi^{209} + {}_{2}He^{4} \longrightarrow {}_{85}At^{211} + 2{}_{0}n^{1} \text{ (neutron)}$$

The astatine was distilled from the bismuth target at high temperatures and collected in a liquid air trap. The astatine was then dissolved out of the trap with dilute HCl, neutralized and made isotonic with NaOH.[1]

The radioactive property of astatine which makes it so interesting is its decay by almost pure alpha particle emission with an average half-life of 7.5 hours.

(A) 40 percent decays as follows:

$$_{85}At^{211} \longrightarrow {}_{83}Bi^{207} + {}_{2}He^{4} \text{ (5.89 mev alpha particle)}$$

(B) 60 percent decays as follows:

$$_{85}At^{211} \xrightarrow{\text{K-capture}} {}_{84}Po^{211} + \text{90 kilovolt X-ray}$$

This portion of the astatine captures an electron from the "K" shell, turning one proton into a neutron and forming polonium. The X ray is of importance because it is used to count the radioactivity of the astatine sample. The alpha particles emitted by the astatine have too short a range to be detected with an external Geiger counter. By measuring the quantity of X ray emitted, the amount of alpha emission can be directly calculated. The polonium which is also formed by the decay of astatine has an extremely short half-life of 5×10^{-3} seconds and decays to lead with the emission of an alpha particle according to the following formula:[2]

$$_{84}Po^{211} \longrightarrow {}_{82}Pb^{207} + {}_{2}He^{4} \text{ (7.4 mev alpha particle)}$$

Chemically, element 85 is a halogen. Iodine is its closest homologue. Some experiments with astatine have been carried out on guinea pigs[3] and rats[4] with respect to its physiologic fate and biologic effect.

With the dosage employed, astatine has been shown to do no damage to vital organs other than the thyroid. It shares the unique property of iodine in being more selectively absorbed by the thyroid than by other tissues in the body. The accumulation of astatine in sufficient amounts by the thyroid produced extensive damage to the glandular epithelium. Except in the thyroid, astatine was rapidly excreted, mainly by the kidneys.

If the human thyroid could be protected from the astatine, it was probable that there would be no other harmful effects. Its short half-life of seven and a half hours, plus rapid elimination, meant that the body as a whole would be protected from any long exposure to its radioactive or toxic effects.

No data at all were available as to the effect of alpha irradiation upon intraocular structures. Neither was there any report on the effect of astatine upon primates. No information was available as to safe dosage levels. All of these factors had to be investigated before its use in humans was placed before the Isotopes Committee of the University of California for their consideration.

Experimental use of $_{85}$Astatine^{211} on the eyes of rhesus monkeys

The eyes of lower animals have no true Schlemm's canal. It was necessary to use a primate as the experimental animal in order to determine the effect of astatine upon the drainage channels. It seemed probable that astatine, like any halogen, would leave the eye by direct aqueous flow into the general blood circulation. It was thus possible to investigate both astatine's intraocular and general systematic effect. The rhesus monkey was chosen and proved admirable for the purpose, though none of them endeared itself to the investigators.

The monkeys were anesthetized with ether. A 28-gauge needle was inserted obliquely through the cornea and a small volume of aqueous aspirated in a tuberculin luer. An equivalent volume of astatine solution, varying from 0.05 to 0.2 cc., was injected into the anterior chamber. The activity of the dose varied from zero to 220 mc.

Protection of personnel from radioactive damage was accomplished merely by wearing rubber gloves. The penetration of alpha particles is almost completely stopped by that thickness of rubber. Luers, needles, and test tubes were set aside for 48 hours. By the end of this period the normal decay process had eliminated all detectable radiation.

Immediate results

The moment that astatine solution was injected into the anterior chamber a chemical iritis was produced. The pupils constricted. The iris developed a muddy appearance. A gray shagreen appeared on the anterior face of the lens. The aqueous was filled with

TABLE 1

Dosage and reaction, in nine monkeys

Monkey	Eye	Dosage	Reaction		
			One week	Two weeks	Three weeks
1	Right	3.4 mc.	+	0	0
	Left	Saline	0	0	0
2	Right	1.7 mc.	0	0	0
	Left	1.7 mc.	0	0	0
3	Right	3.4 mc.	0	0	0
	Left	6.75 mc.	+	+	0
4	Right	Saline	0	0	0
	Left	0.6 mc.	0	0	0
5	Right	0.675 mc.	0	0	0
	Left	0.34 mc.	0	0	0
6	Right	77.0 mc.	+++	+++	++++
	Left	22.0 mc.	++	+	+
7	Right	143.0 mc.	++++	++++	++++
	Left	55.0 mc.	+++	+++	+++
8	Right	222.0 mc.	++++	++++	++++
	Left	55.0 mc.	+	0	+
9	Right	At*	0	0	0
	Left	At⁻	0	0	0

Fig. 2 (Shaffer). Control monkey. Picture taken at the same time as Figure 3.

Fig. 3 (Shaffer). Hypothyroid monkey No. 6, the year after treatment with 99 mc. of radiation.

myriads of cells, pigment floaters, and a heavy flare. Descemet's membrane was slightly wrinkled. All these changes had faded markedly in one to two hours, but some iritis was present for two or three days. The intensity of this reaction varied directly with the concentration of astatine. A saline control injection produced a few cells, but no flare. Astatine solution placed in the conjunctival sac caused only a mild redness.

The disappearance time of the radioactive material was followed by Geiger counters. All detectable radioactivity had disappeared from the anterior segment in four to five hours. The rate of disappearance followed a simple curve, showing that the astatine left the eye by direct flow, as one would expect of an halogen. There was no flattening of the curve, as would occur if it were plating out on intraocular structures.

Delayed results in general

After the initial period of iritis, the general health of the monkeys receiving less than 10 mc. was unaffected. Those receiving dosage in excess of 100 mc. were made ill; they seemed much more apathetic than before, content to sit quietly in the back of their cages, and only when handled did their former belligerence assert itself.

Monkey No. 6 (see table 1) received 99 mc. of radiation. One eye was badly damaged by its dosage of 77 mc., but the other eye was almost unaffected by 22 mc. The monkey has been kept alive for over a year and has become progressively more listless. His appearance is dejected and he appears cold much of the time. His hair has become lifeless, brittle, and less abundant. In short, he now presents the classical appearance of hypothyroidism (figs. 2 and 3).

Monkeys 7 and 8 received 198 and 275 mc. of radiation respectively. They were undergoing similar changes when they were killed four months after the astatine had been injected. At the autopsy it was completely impossible to find a thyroid gland. A whole block of tissue including the trachea and larynx was removed and sectioned. By careful search a few areas of recognizable thyroid tissue could be found. Elsewhere the acini of the thyroid were entirely destroyed. Interestingly enough, an entirely normal parathyroid gland sat in the midst of these

destroyed cells (fig. 4 and color plate, fig. d).

This demonstrates the tremendously destructive local action of alpha irradiation, and its extremely short range of penetration. The destruction of the thyroid gland without damage to the parathyroid suggests that the element might be a valuable agent in the treatment of hyperthyroidism.

Radioactive iodine which has been successfully used in such cases emits beta irradiation with a much deeper range of penetration. This increases fibrosis in contiguous structures and makes subsequent surgery difficult. This might be avoided by using astatine. Further research along this line is being undertaken.

Delayed results on the eye

By the end of one week the chemical iritis had largely subsided in those eyes treated with small doses of astatine. With larger doses, radiation effects appeared quite promptly and reached their peak in two to four weeks. Twenty-two mc. of radiation caused little ocular damage. There was slight corneal edema for four weeks. The pupils had a very sluggish light reaction and the iris stroma seemed smoother than normal.

In dosages over 50 mc., extensive damage was produced in four out of five eyes. The changes in all of these eyes were similar, varying only in degree. At first the eyes resembled a severe iritis, with deep anterior chambers, muddy irises, and hazy vitreous bodies.

By the end of the second week the posterior segment could no longer be seen. This was due to increasing edema of the cornea, with stippling of the epithelium and irregular staining. Descemet's membrane was increasingly wrinkled. Soon it was impossible even to see the iris. With the exception of the left eye of monkey No. 8, the corneas were completely opaque when the animals were killed (fig. 5 and color plate, fig. c).

Pathology of eyes showing radiation damage

Little change was noted in eyes receiving less than 50 mc. (fig. 6). The following

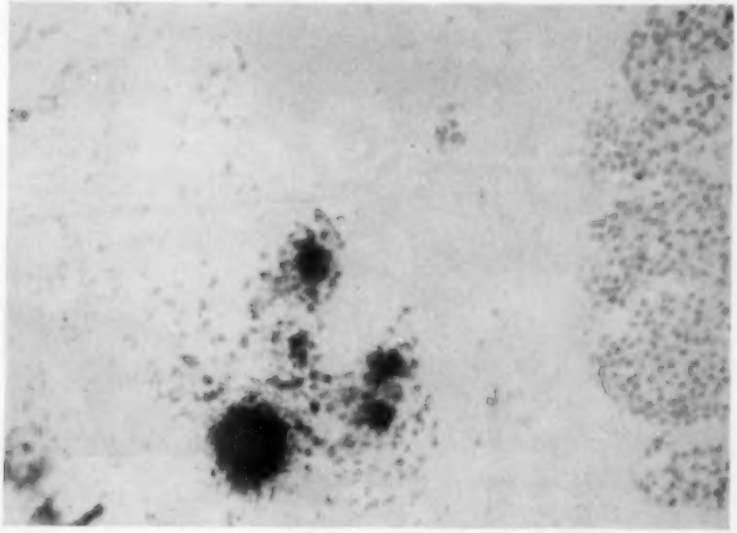

Fig. 4 (Shaffer). Autoradiogram of thyroid, showing radioactive astatine in acini of partially destroyed thyroid gland. Unaffected parathyroid gland is in the right-hand portion of the section.

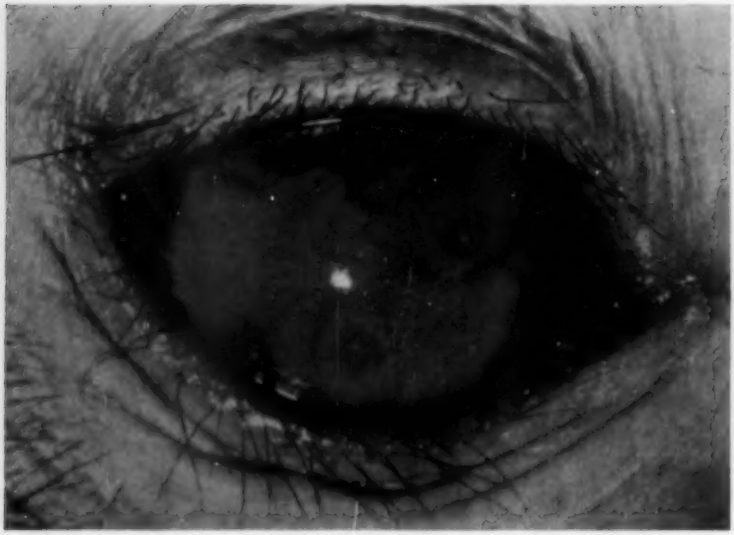

Fig. 5 (Shaffer). Right eye of monkey No. 8 three months after treatment with 200 mc. of irradiation.

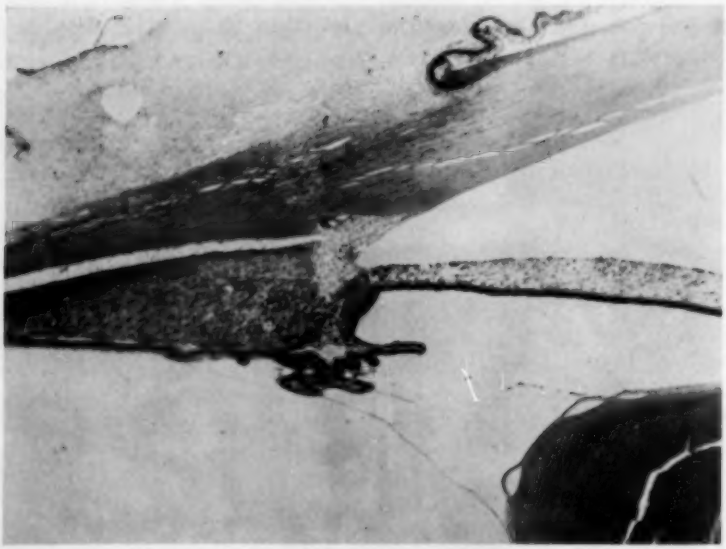

Fig. 6 (Shaffer). Normal angle of a monkey's eye.

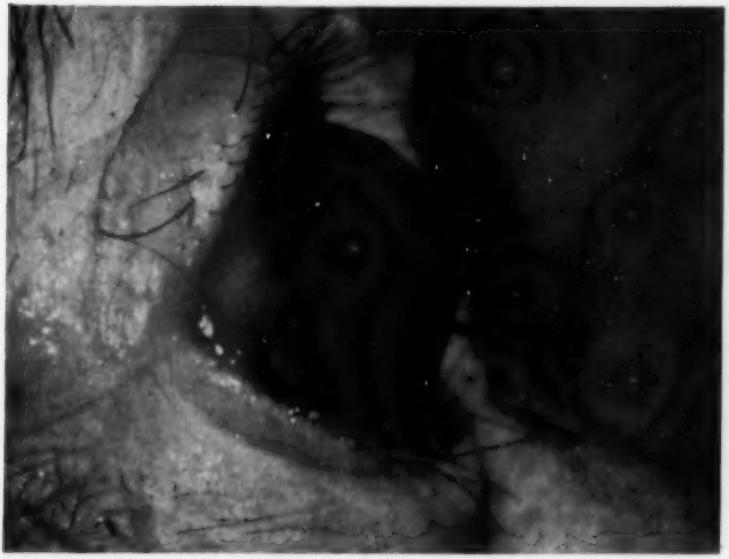

Fig. 7 (Shaffer). Side view of monkey, showing ectasia of the cornea.

changes were found in those eyes treated with more than 50 mc.

Gross anatomy

The anteroposterior diameter of the eyes was increased. This increase was due to an ectasia of the anterior segment which resembled a marked keratoconus (figs. 7 and 8).

Microscopic anatomy

Circumcorneal tissues. Conjunctival edema with congestion of the vessels and perivascular round-cell infiltration was present.

Cornea. The epithelium showed vesicular changes with infiltration by inflammatory cells. In the central cornea the epithelium was missing in many areas. Bowman's membrane was thin at the periphery and completely absent centrally. The principal changes involved the stroma, particularly in the central two thirds of the cornea. Here the stroma became tremendously thickened and the lamellas were separated by empty spaces which probably contained fluid in vivo. Some of the deeper lamellas appeared to have their normal staining and configuration (fig. 9).

The damaged stroma was infiltrated by blood vessels and chronic inflammatory cells. At the site of this degeneration the cornea

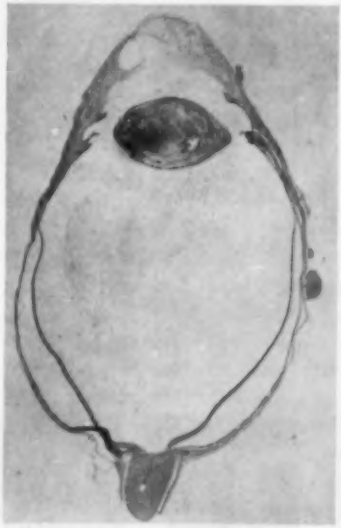

Fig. 8 (Shaffer). Section of eye demonstrating corneal edema as the cause of ectasia.

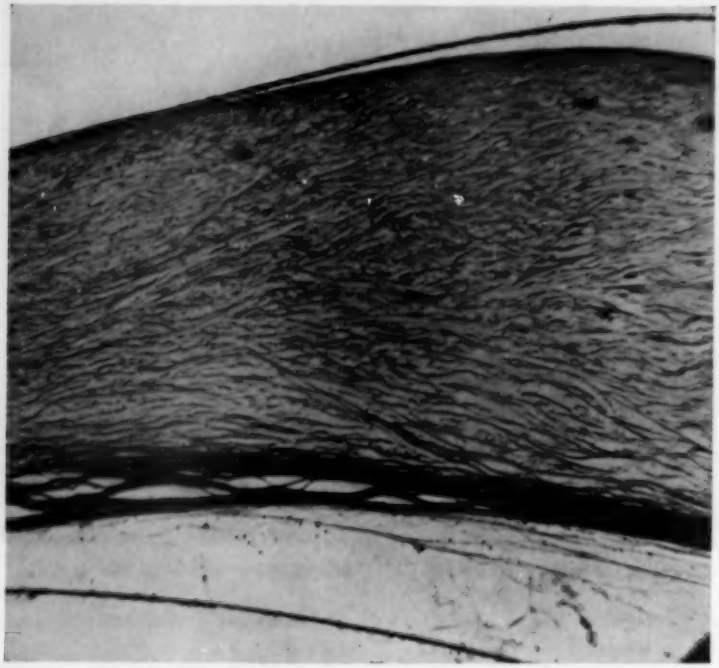

Fig. 9 (Shaffer). Separation of corneal lamellas by edema.

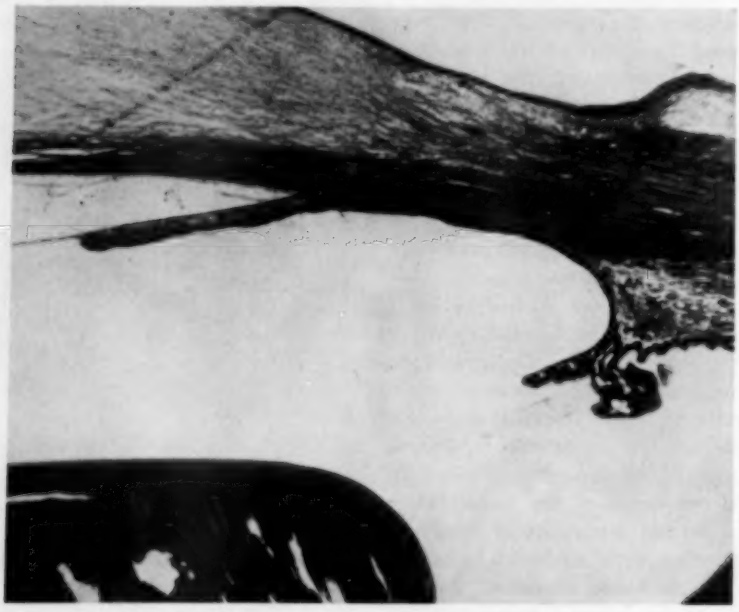

Fig. 10 (Shaffer). Fibrosed trabeculum, with complete occlusion of the angle.

Fig. 11 (Shaffer). Small anterior synechia in the eye of monkey No. 8, treated with 55 mc. of radiation.

was ectatic. Descemet's membrane was detached by a fibrinous exudate and was lined by an altered endothelium which showed flattening, proliferation, and accumulation of pigment (figs. 9 and 10).

Limbus and sclera. The trabeculum was densely fibrosed and compressed. Schlemm's canal was barely recognizable in most of the sections. The sclera was normal (fig. 10).

Anterior chamber. The peripheral chamber was totally obliterated by wide adhesions of iris to cornea. The central chamber contained a fibrinous exudate and shreds of the detached Descemet's membrane (fig. 10). One small anterior synechia was formed on one side of the eye receiving 55 mc. (fig. 11).

Iris and ciliary body. The iris was extremely atrophied and fibrosed, with partial destruction of the pigment layer. The ciliary processes were shortened and fibrotic. The muscularis and stroma of the ciliary body showed degeneration and fibrosis. Over the pars plana, the epithelium was not altered (fig. 12). A posterior synechia was present in the eye receiving 22 mc.

Choroid, retina, and optic nerve. No abnormality could be seen.

Vitreous body. Some cells and fibrinous exudate lay in the anterior portion of the vitreous body.

Lens. There was extensive cataractous degeneration of the lens. The capsule was intact and showed no alteration in thickness. The lens epithelium beneath the capsule was unchanged except in the equatorial region where the usual arrangement of cells was replaced by a cytoplasmic swelling of the cells and the lack of formation of lens fibers.

Some of the cells containing nuclei extended back beneath the posterior capsule. The principal changes occurred beneath the capsule where there was extensive degeneration of the lamellas with formation of large globules (fig. 13). There was some degenera-

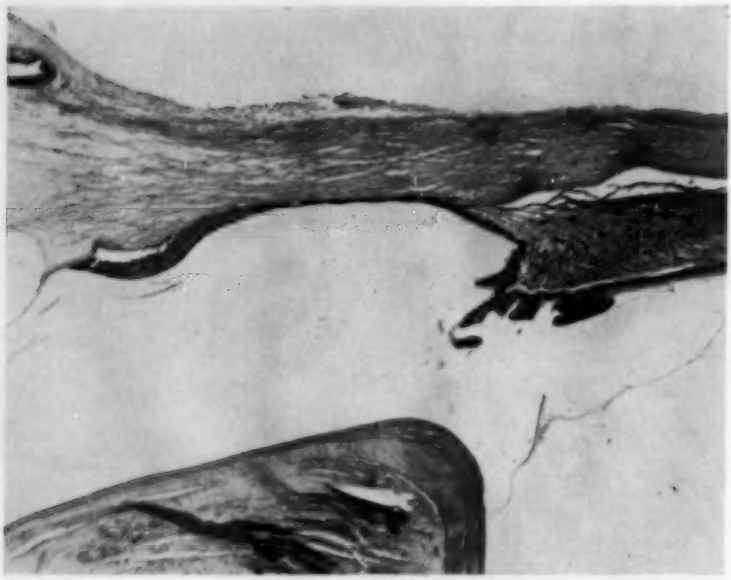

Fig. 12 (Shaffer). Atrophy and fibrosis of iris and ciliary body.

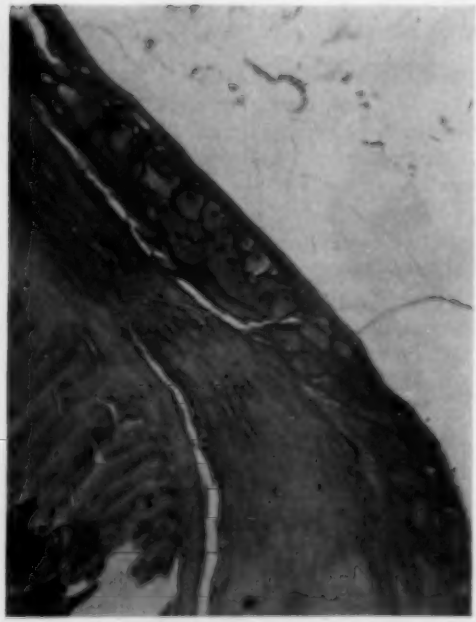

Fig. 13 (Shaffer). Cataractous changes in the lens near the equator.

tion beneath the anterior capsule with the formation of fine spaces containing a granular debris extending inward almost as far as the nucleus.

Summary of the experimental results

The experiments showed the capacity of alpha particles to produce extensive radiation damage to any ocular structure if a sufficiently heavy dosage was used. In the rhesus monkeys, radiation of 50 mc. produced extensive and permanent destruction of intraocular tissues; 25 mc. produced some damage, but repair was practically complete in four months. Less than 10 mc. caused no lasting damage to the eyes.

The corneal pathology produced by astatine can be explained by its radiation effect upon Descemet's membrane. This damage caused the extensive edema and ectasia which occurred.

Exudation into the angle and iris edema produced prominent peripheral synechias. It is possible that an actual perforation of the

corneas occurred to produce synechias extending out so far on the posterior corneas. The lens changes are typical of radiation cataracts. The lens damage produced by alpha radiation is the same as that seen in neutron and X-ray irradiation.

The thyroid gland took up astatine in the same way that iodine is absorbed. Within the acini of the gland the alpha particles bombarded the epithelial cells and destroyed them. There was no radiation effect beyond the thyroid epithelium as was shown by the uninjured structure of the parathyroid gland. Obviously some protection would be necessary to safeguard the thyroid if astatine were to be used therapeutically in the human.

Experimental use of astatine in an epithelial cyst

Data were now available which made it seem relatively safe to treat the epithelial cyst previously mentioned. The case history of this patient forms an interesting chapter in itself.

The patient, a 55-year-old white American, was first seen in December, 1946, complaining of dim vision in his left eye. Examination showed an immature cataract of the left eye, involving the anterior and posterior cortex. No cause for the cataract could be found. He did state that the left eye had had a contusion in his childhood, but thought that there had been no residual damage. A few peripheral lens opacities were present in the right eye.

The cataract became mature in the course of the next 12 months, and in January, 1948, the lens was removed. The extraction was performed extracapsularly, using a two-mm. conjunctival flap, three McLean sutures, a keratome-scissors section, and a peripheral iridectomy. The central McLean suture was cut in making the section and had to be replaced. Otherwise, the technique of extraction was satisfactory, and the immediate postoperative course uneventful.

Two months after the operation, refraction showed that the vision with a +9.75D. sph. ⌒ +1.0D. cyl. ax. 85° was 20/30.

At that time the eye was suddenly overwhelmed by a severe intraocular infection. The anterior chamber was filled with a heavy, flocculent exudate; a plug of mucopurulent material projected between the lips of the conjunctival incision at the former position of the central corneoscleral suture; no fundus reflex could be seen.

Smears were made, and numerous gram-positive cocci were found. The patient was immediately hospitalized. He was treated systemically by high doses of penicillin and sulfadiazine, and by typhoid injections. Locally, the eye was treated with scopolamine, sulfadiazine ointment, and daily iontophoresis of penicillin and sulfadiazine. The second day, the patient developed a mild exfoliative dermatitis, so all medication was discontinued except iontophoresis with penicillin and sulfadiazine. The infection subsided as by magic and within a week the eye seemed safe.

There was no pupillary membrane formed. The pupil was pulled up slightly by a peripheral anterior synechia at the 12-o'clock position. A shred of tissue resembling lens capsule could be seen gonioscopically extending through the peripheral iridectomy into the inner aspect of the incision line. The vitreous cleared and it was then possible to see some exudate about the macula.

Vision was diminished to 20/70 due to a central scotoma. Tension remained normal. The inner surface of the upper fifth of the cornea was hazy and looked much like an early epithelial downgrowth. When there was no change in its appearance in the next three months, it was decided that the haze was due to fibrous tissue. Several consultants shared this opinion.

In January, 1950, the patient returned for a check-up. In the upper part of the anterior chamber was a definite epithelial cyst, enclosed by iris stroma. It was at this time that surgical excision would have been attempted, had it not been for the gonioscopic findings. As is shown in the drawing (fig. 1,

and color plate, fig. a) there was a long extension of the cyst in the medial angle. Its removal by surgical means would have meant sacrificing one third of the iris.

The hazards of surgical removal, plus the uncertainties of chemical treatment and of X-ray therapy, led to the research on astatine previously described. During the year that these experiments were being carried out, the cyst was repeatedly evacuated. It refilled in about four weeks. At first, 0.05 cc. could be aspirated, but by the end of a year this volume had increased to 0.1 cc.

The experimental results obtained from the rhesus monkeys allowed a scientific appraisal of the hazards of using astatine in the treatment of this anterior chamber cyst in a human. Minimal effective dosage had been found to lie between 10 and 25 mc. Serious damage could be expected above 50 mc. The radiobiologists calculated that 10 mc. of radiation should destroy a cyst wall made up of three or four layers of stratified squamous epithelium, provided that the cyst wall had some tendency to retain the astatine.

The Isotopes Committee gave permission to use this small dose in the human. The dose was well below that which produced damage in a monkey eye which is one-fourth the size of the human eye. Furthermore, this eye was aphakic, so that lens damage was not a factor. The danger of damage to the thyroid gland was minimal. A four-kg. monkey suffered no thyroid damage with this dosage, so one would not expect trouble in a 70-kg. man. Furthermore, the patient was put into iodine block by giving one gm. of potassium iodide daily for four days before the astatine was to be injected.

Cyst injection by astatine

The 15th evacuation of the cyst was performed on March 7, 1951. March 29, 1951, was set for the injection of astatine.

Exceptional teamwork from the personnel of Crocker Laboratory was required to obtain the material at the scheduled time, in the desired concentration and in chemically and biologically pure form. The cyclotron was run most of the preceding night. Chemists collected the astatine and neutralized and sterilized the solution. The radiobiologists assayed its degree of radioactivity and brought it in lead containers to the hospital.

At the hospital, the patient had had his eye prepared as for major surgery. The eye was anesthetized with pontocaine, 0.5 percent. No novocaine was injected. With a 28-gauge needle, which had been especially sharpened, a beveled incision was made through the cornea and into the cyst; 0.04 cc. of the cyst's contents were aspirated; the luer was removed from the needle and was replaced by a tuberculin luer containing the 10 mc. of astatine in 0.02 cc. of solution. This was injected into the cyst, partially refilling it. Little discomfort was experienced by the patient. For two hours, a faint flare and a number of pigment floaters could be seen in the aqueous. This disappeared almost entirely by the end of four hours.

The Geiger counter demonstrated that the radioactive matter in the calculated dosage of astatine was actually in the eye and seemed to be localized to some extent over the cyst. The disappearance time of the astatine was followed by repeated measurements of radioactivity in comparison with a sample of astatine of similar strength.

Readings were taken every 15 minutes for the first two hours; then at decreasing intervals for 12 hours. By the end of nine hours, no radioactivity was demonstrable in the eye, but the comparison sample was still quite active. The disappearance curve was similar to that in the monkey except that the astatine remained almost twice as long as in the monkey eye.

At no time was it possible to find any evidence of radioactivity over the thyroid gland, showing that it was in effective iodine block. The only untoward reaction was one episode of urinary incontinence on the second day. This was doubtless due to bladder irritation from the astatine as it was being eliminated.

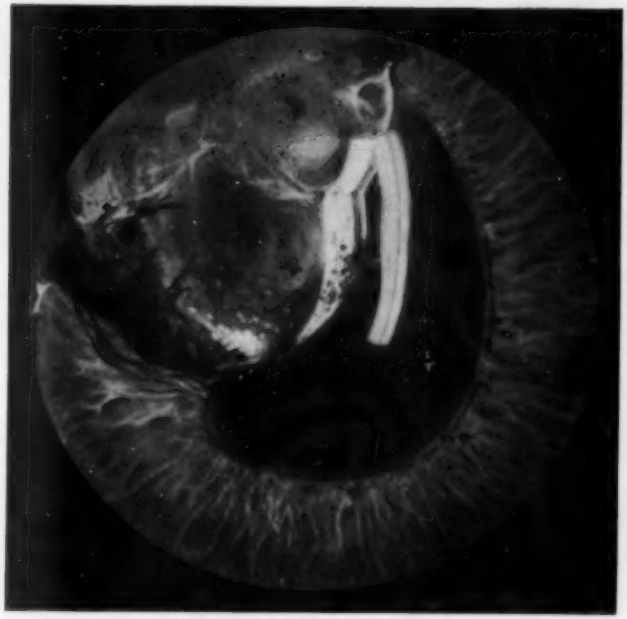

Fig. 14 (Shaffer). Anterior chamber cyst one month after treatment with astatine, showing sediment in the bottom of the sac.

The eye tolerated the procedure surprisingly well. There was only slight redness. By the second day a haziness of the endothelium of the upper part of the cornea could be seen and by the next day the stroma was slightly thickened and definitely edematous. The epithelium was hazy, irregular, and showed stippled staining with a fluorescein solution. This edema was diminished but still present eight months after the injection. During this period the patient had no pain, but did complain of some photophobia and tearing.

One month after the injection, the contents of the cyst seemed more turbid than usual and soon a white layer of sediment could be seen collecting in the bottom of the sac. This never exceeded half a millimeter in depth (fig. 14 and color plate, fig. b).

When the cyst was evacuated six weeks after the treatment, the contents were examined microscopically. The sediment contained a few epithelial cells, some white blood cells and some crenated basophilic red blood cells. The sediment did not reform. The cyst continued to look as healthy as ever, though it now refilled much more slowly.

It now seemed definite that the epithelial cells of the cyst were too resistant to be destroyed by this amount of radiation. The endothelium had been sufficiently damaged to produce a corneal edema lasting at least eight months. It seemed certain that a dose of astatine of sufficient potency to destroy an epithelial cyst would produce irreversible corneal changes which would probably ruin the eye. Reluctantly it was decided that astatine was not the ideal form of treatment for epithelial cysts of the anterior chamber. If there is any evidence of extension, surgical removal will probably be attempted.

Summary

The newly discovered element, $_{85}$Astatine^{211}, created by the cyclotron, has been shown to be a source of almost pure alpha irradiation. Alpha rays are an extremely active type of radiant energy whose short, one-mm. range of penetration may make them valuable in the treatment of eye diseases in which maximum radiation is de-

sired, with minimum damage to deeper structures.

Experimental studies are presented on the effect of varying doses of alpha irradiation on the anterior segments of the eyes of rhesus monkeys. Doses of 25 mc. or less caused little permanent ocular damage. Doses of 50 mc. or more produced extensive corneal edema, anterior synechias, iritis, and radiation cataracts.

It was found that astatine was selectively picked up by the cells in the thyroid gland. In adequate doses, the thyroid cells were completely destroyed. The adjacent parathyroid gland was completely unharmed. The possible usefulness of astatine in hyperthyroid disease is suggested.

A case report is presented of an epithelial cyst of the anterior chamber treated by injection of astatine. The epithelial cells were found to be too resistant to be destroyed by this radiation without using doses potentially dangerous both to the eye and to general health.

490 Post Street (2).

I wish to express my indebtedness to Joseph G. Hamilton, M.D., and Kenneth G. Scott, Ph.D., of the Crocker Radiation Laboratory of the University of California School of Medicine in San Francisco. I also wish to thank the personnel of the 60-inch cyclotron of the Crocker Radiation Laboratory, and the staff of the Francis I. Proctor Laboratory of the Division of Ophthalmology. Without the advice, assistance, and technical knowledge of all of these men and women, this work would have been impossible.

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Ophthalmic Miniature

The fourth and last (of simples) is as follows Rx infant's urine, lib. 1, honey onz 4, boil in a copper vessel, skimming off the foam, until it is reduced to half the quantity, then strain and place in a glass jar, and put it in the eye as directed.

I must not omit however, to advise that he have his eye licked by a child, either girl or boy. But before they lick, they should chew fennel seed or sweetflag root. And with the help of God, I think that this will suffice.

Ugo Benzi (1376-1439) Consilium 24,
(Lockwood, *Ugo Benzi*, University of Chicago 1951, page 145.)

FIG. A

FIG. B

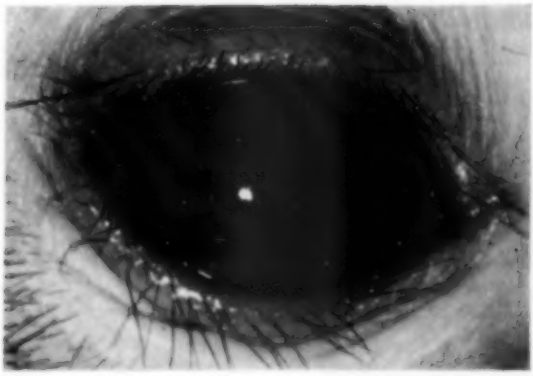

FIG. C

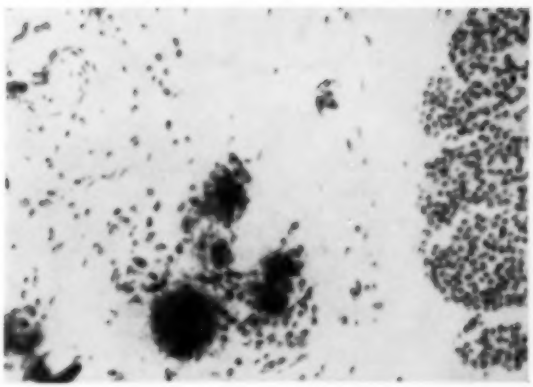

FIG. D

FIGS. A TO D (SHAFFER). ALPHA IRRADIATION: EFFECT OF ASTATINE ON THE ANTERIOR SEGMENT AND ON AN EPITHELIAL CYST.

(FIG. A) GONIOSCOPIC VIEW OF ANTERIOR-CHAMBER CYST, SHOWING EXTENSION OF CYST ALONG ANGLE WALL.

(F.G. B) GONIOSCOPIC VIEW OF ANTERIOR-CHAMBER CYST ONE MONTH AFTER TREATMENT WITH ASTATINE, SHOWING SEDIMENT IN THE BOTTOM OF THE SAC.

(FIG. C) RIGHT EYE OF MONKEY NO. 8 THREE MONTHS AFTER TREATMENT WITH 200 MC. OF IRRADIATION.

(FIG. D) AUTORADIOGRAM OF THYROID, SHOWING RADIOACTIVE ASTATINE IN ACINI OF PARTIALLY DESTROYED THYROID GLAND.

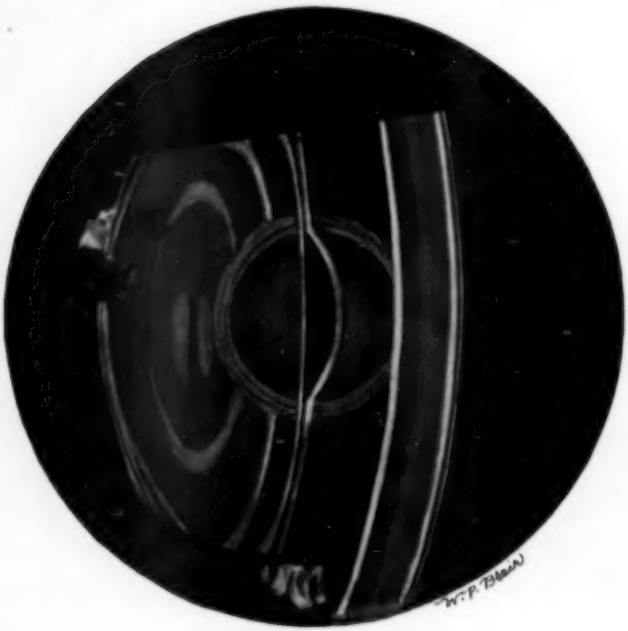

FIG. 1 (STRAATSMA, CANCILLA AND HOHN). ANTERIOR LENTICONUS.
ANTERIOR LENTICONUS AS SEEN IN THE RIGHT EYE OF A 21-YEAR-OLD MAN. THIS IS A COMPOSITE ILLUSTRATION DETAILING THE LENS MORPHOLOGY AS VIEWED WITH THE BIOMICROSCOPE. THE SPECIFIC MORPHOLOGIC FEATURES MAY BE IDENTIFIED BY REFERRING TO THE NUMBERS GIVEN TO CORRESPONDING LINES IN FIGURE 2.

ANTERIOR LENTICONUS

Review and case report

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Portsmouth, Virginia

Introduction

Anterior lenticonus is a rare structural anomaly of the crystalline lens characterized by a localized conical or spherical protrusion centered about the pole of the anterior lens surface. Several authors[1,2] have attempted to classify this condition into lenticonus and lentiglobus, applying the former term when the anterior prominence was cone-shaped and using the latter when the protrusion was spherical. However, such a division is based on mathematical structure instead of etiology or pathogenesis and at the present state of our knowledge offers little advantage. In this paper the example of Rones[3] and Marsh[4] will be followed and lenticonus will be used as a comprehensive term including conical and spherical protrusions.

Clinical picture

The clinical picture of anterior lenticonus has been amply described and the characteristics are distinct enough to permit accurate diagnosis. Most outstanding is the pathognomonic feature of a conelike or spherical structure protruding from the center of the anterior surface of the lens into the anterior chamber. This is apparent when observed with oblique illumination and most adequately studied by the refinements of biomicroscopy.

Second in importance is the dark disc seen centered in the pupil in the direct illumination of ophthalmoscopic observation. This disc has been compared to the appearance of an "oil globule in water," and is due to the fact that prismatic reflection in the sharply curved axial area does not permit rays reflected from the fundus to reach the observer's eye.[5]

The increased curvature in the area of the conus also results in a high degree of axial myopia, while the peripheral area may be emmetropic or, more commonly, hyperopic.[3]

Other optical phenomena related to this central conus are the abnormal behavior of the Purkinje images[6,7] and the inverted, real image produced by direct ophthalmoscopy through the axial lens area. A virtual, upright image is seen through the near emmetropic lens periphery.[2]

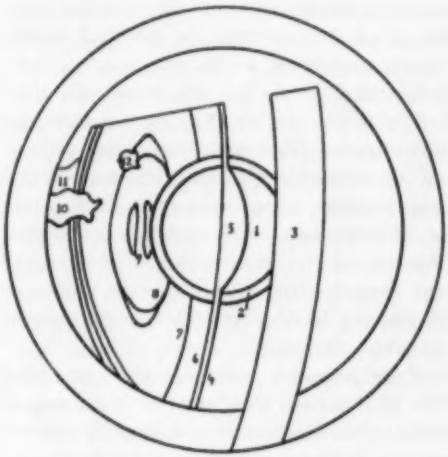

Fig. 2 (Straatsma, Cancilla, and Hohn). Under diffuse illumination the spherical convexity of the lenticonus (1) could be viewed in its entirety with a distinct ring (2) surrounding its base. An optical section of this area showed the corneal section (3) and the anterior lens capsule (4). The lens capsule was sharply deflected at the base of the lenticonus and covered the almost nonrelucent mass of the conus (5). Behind the conus was the anterior stripe of disjunction (6), the anterior stripe of the adult nucleus (7) (interrupted only for purposes of illustration), and the anterior outer (8) and inner (9) stripes of the fetal nucleus. At the temporal periphery of the lens was a subcapsular sector cataract with anterior (10) and posterior (11) limbs, as well as a small anterior subcapsular opacity (12).

Cases in literature

Despite the distinct structural alteration of this anomaly and the characteristic optical phenomena produced, it has been only infrequently described in medical literature. Webster[8] reported the first case in 1874, while a review of anterior lenticonus by Rones, in 1934, added nine unquestionable case reports. Ehrlich[9] cited 10 additional cases from the literature between 1934 and 1946, and added a most unusual case from his personal experience. Brief résumés of these 21 cases are included in the excellent papers by Rones and Ehrlich so that repetition of this material is not necessary.

In 1948, Sen[10] published a report of anterior lentiglobus that was conceded to be atypical by the author. This defect, noted in the right eye of a 14-year-old Sikh boy, was described as an irregularly spherical, transparent protrusion of the anterior lens surface with a 3.0 by 2.0 mm. ovoid base situated superior and nasal to the anterior lens pole. Several lines of tension were present on the surrounding anterior lens capsule and torn capsular edges were seen curling forward at the base of the anterior protrusion. Because of eccentricity, the ovoid base and the irregular and pitted surface, this case should not be considered a true example of anterior lenticonus.

Fronimopoulos and Joannadis[11] described the 22nd patient with anterior lenticonus in 1950. This lesion occurred in a 25-year-old man who had noted progressive diminution in vision for five years. Examination disclosed bilateral anterior and rudimentary posterior lenticonus. Biomicroscopy revealed that the anterior lens capsule and anterior stripe of disjunction were parallel and passed over the anterior bulging conus without interruption. There was a line of opacities in the area of the conus under the anterior cortex. Except for this line of opacities, the nuclear lens structure was normal. There was no history of eye disease or poor vision in other members of the family, but examination of the relatives could not be carried out.

Incidence

From these 22 cases certain facts concerning the incidence of this anomaly become apparent. The abnormality has been reported from all continents save Africa and Australia, and when relative medical facilities and populations are considered, there is definitely no geographic area of predilection.

Most authors[7, 9] have tended to discount a familial incidence of anterior lenticonus, although it must be admitted that examination of relatives has not been described in the various case reports. The only cases supporting genetic transmission of this anomaly were published by Zavalia and Oliva.[12] These authors reported two brothers, aged 15 and 23 years, who developed anterior lenticonus at puberty. Significantly enough, the parents of these siblings were cousins. From this limited data no generalization concerning possible hereditary influence can be made.

Sex and age

There is a marked preponderance of males in the published reports. In 21 cases in which sex was stated (excluding the report by Ter-Artuniantz, Kotilianskaja, and Chutko[13] of which only the abstract is available), 19 patients were males and two were females (reported by Venneman[14] and Rocha and Coscarelli.[15])

It is also striking that in the same 21 cases both eyes had lenticular abnormalities. In 19 of these there was bilateral anterior lenticonus, whereas in two (the younger patient of Zavalia and Oliva, and Ehrlich's case) there was unilateral anterior lenticonus with contralateral anterior capsular cataract.

Evaluation and interpretation of the age at which these cases were diagnosed and reported present definite problems. Most patients had noticed progressive diminution in vision for several years before medical aid was sought. Others with associated lesions[16] had noticed poor vision all their lives. How-

ever, the youngest patient discovered clinically was an Arabian youth, aged 10 years,[17] and the oldest was a 48-year-old man.[18] The disease was most frequently noted at puberty and in early adult life. At least nine cases were discovered in the third decade.

Structural features

Agreement on general structural features of lenticonus has been unanimous and all authors reported the conus in the axial portion of the lens. The shape varied from conical to spherical but the base was circular and the protrusion sharply localized. The diameter of the circular base was measured in several cases and varied from 2.5 mm.[9, 11] to 4.0 mm.[15, 19]

The development of biomicroscopy provided an unexcelled opportunity for study of the deranged lenticular morphology in anterior lenticonus, and since Kienecker's[19] first account in 1929, most authors have made detailed observations. Therefore, there are now some 13 patients on whom biomicroscopic findings have been recorded.

Unfortunately, the necessity of referring to abstracts in certain cases and variations in terminology make exact comparisons difficult, but certain general facts are manifest.

All reports agreed that the embryonic and fetal nuclei were structurally unaltered by the lens deformity. The adult nuclei were involved in only two patients with anterior lenticonus. In one of these two patients, the elder brother reported by Zavalia and Oliva, a concavity corresponding to the lenticonus was noted in the usually convex surface of the anterior band of the adult nucleus. The other case, reported by Marback,[20] depicted the lenticonus involving the anterior lens capsule and the anterior portion of the senile nucleus. The condition of the anterior cortex was not described in Marback's publication.

The most frequent structural deviation in anterior lenticonus consisted of a marked local thickening of the anterior lens cortex.[11, 15, 16, 19, 21] In these cases, the anterior band of disjunction and anterior lens capsule were unaltered in thickness or parallelism. However, these two bands were sharply deflected at the base of the lenticonus, and, while arching over the prominence of the conus, they had a decreased radius of curvature.

Another aberration in structure was noted by Knobloch[22] and Ehrlich. Their patients had a local blisterlike bulge at the anterior pole of the lens in which only the anterior lens capsule was deflected over the conus. The underlying anterior band of disjunction took no part in the lens deformity.

Associated aberrations

Detailed examinations of the lens with the aid of oblique illumination have demonstrated that anterior lenticonus is not uncommonly associated with other aberrations in lens morphology. The most unusual abnormality was the case of Fronimopoulos and Joannadis, already cited, in which rudimentary posterior lenticonus was associated with the anterior protrusion.

Associated lens opacities were mentioned by Webster, Jaworski, deSchweinitz and Wiener,[23] and Riedl[24] in the earlier papers. More recent studies have revealed anterior capsular opacities,[9, 17] fine subcapsular cataracts in the axial area,[11, 17, 21] coronary type lens opacities,[15] and bilateral congenital, discoid, punctate cataracts,[16] as well as progressive lens opacification following capsule rupture.[9]

These introductory considerations have dealt primarily with the diagnostic characteristics of anterior lenticonus and a comparison of the 22 cases now reported in the literature. It was noted that there was no geographic or definite familial predilection, but that the disease most commonly developed bilaterally in males during young adult life.

Lenticonus involved the axial lens area, and was conical or spherical in form. Biomicroscopic observations on some 13 cases showed that the lens nuclei were almost always normal, while the deformity usually in-

volved the anterior lens cortex, band of disjunction, and lens capsule. Anterior lenticonus was not infrequently associated with lens opacities of various types. With these comparative features as a background, the following case report can be considered.

Case report

History

This 21-year-old white, single seaman was referred to the eye clinic of the United States Naval Hospital at Portsmouth, Virginia, on December 30, 1952, with the chief complaint of blurred vision in the right eye of two years' duration.

On February 7, 1950, the patient had a natural visual acuity of 20/20 (Snellen) in each eye when examined for naval reserve enlistment. However, shortly thereafter he noted the gradual onset of blurred vision in the right eye which increased in severity during the following six months. This blurring of vision was most marked in bright light, although discomfort from glare and dazzling did not seem excessive.

In July, 1950, he consulted a civilian doctor who told him there was a scar in the right eye and suspected a penetrating injury due to a glass fragment. This physician prescribed corrective lenses (O.D. −1.0D. sph. ⊂ + 1.0D. cyl. ax. 90°; O.S., plano), but these provided no appreciable subjective improvement and were not worn.

On December 3, 1951, he was examined for active duty in the United States Navy and an acuity of 20/25— (14/20 Navy Notation Equivalent, American Optical Company) was noted in the right eye and 20/20 in the left eye. Repeat examination on March 27, 1952, revealed an acuity of 20/30— (12/20 Navy Notation Equivalent) in the right eye while the left retained 20/20 vision. No other ocular abnormality was noted on these examinations and no attempt at refractive correction was made.

The past history was negative for eye disease, operation, infection, and trauma, save for an injury to the right eye in 1947 while playing football. At that time he was kicked with a cleated shoe and developed a "black eye" as well as "redness" of the globe. However, these reactions subsided spontaneously and completely and no impairment of vision was noted. There was no past history of systemic disease or allergic tendency.

System review was noncontributory save for headaches occurring every two or three weeks, lasting one day and characterized by bilateral, frontal, aching pain without prodromes or gastro-intestinal symptoms.

Personal history revealed a high school education and moderate habits of alcohol intake and cigarette smoking.

The family history disclosed that the patient's father was a diabetic who died at the age of 60 years of a cerebral vascular accident. Two years before his death one eye was enucleated because of "infection." The patient's mother was 55 years of age when she succumbed to complications of a gastric carcinoma. There was no blood relationship between these parents. Only one sibling survives and at the age of 30 years she is in good health. There was no history of cataract or diminished visual acuity in the immediate family. Further family history could not be obtained because the patient is of Italian national background and no other relatives are in this country.

Examination

The patient was well developed and well nourished without acute or chronic physical defect except for the ocular findings.

Eye examination disclosed normal adnexa and motility. Ocular tension was 21 mm. Hg (Schiøtz—5.5 mg. weight) in each eye. Iris structure was intact and the pupils were round, regular, and even, with normal reactions to light and accommodation. The fundi studied under mydriasis were structurally normal and the media were intact, save for a dark circular disc in the right eye centered in the visual line at the level of the lens and almost filling the undilated pupillary aperture.

Biomicroscopy demonstrated normal morphology in both eyes except for the examination of the lens of the right eye. This structure was characterized by a prominent, spherical mound of lenticular material bulging into the aqueous chamber from the anterior surface of the main lens structure.

The base of this elevation was bounded by a geometrically perfect ring centered about the axis of the lens with a slightly diffuse outer border and a sharp circle at its inner edge. The diameter of this sharp inner edge was estimated to be one third the diameter of the maximally dilated pupil or about 2.5 mm.

From this inner circle arose the regular spherical convexity with a smaller radius of curvature than the surrounding anterior lens surface. This elevation, representing somewhat less than half a sphere, had almost no optical relucency and was covered by normal appearing lens capsule. Study of this capsule surface revealed brilliant specular reflection.

In addition, there was a subcapsular, sector cataract involving only a few lamellae near the temporal equator of the lens and extending onto the anterior and posterior surfaces. Near the anterior extremity of this sector cataract was a small, irregularly round, subcapsular opacity. Both of these opacities were entirely separate from the lenticonus.

Further detailed examination of the lens structure showed normal embryonic, fetal, and adult nuclear stripes, as well as anterior and posterior lines of disjunction. None of these stripes was interrupted or altered by the lenticonus.

Natural visual acuity was: O.D., 20/70; O.S., 20/15 (Snellen). Retinoscopy showed central myopia in the right eye, but the accepted correction was: O.D., +3.0D. sph. ⌒ −0.75D. cyl. ax. 180°; O.S., +0.5D. sph. This lens combination gave an acuity of: O.D., 20/50; O.S., 20/15.

Laboratory examination. All indicated laboratory data at random intervals were normal, including chest X-ray films, blood serology, and urinalysis.

Discussion

A discussion of anterior lenticonus should include such features as etiology, pathogenesis, clinical evolution, and treatment. However, consideration of these features must be based in large measure on perfunctory data.

Theories of etiology may be enumerated by following the suggestion of Rones, Clapp,[25] and Bellows that anterior lenticonus be divided into congenital and acquired types. It must be realized, though, that the terms congenital and acquired give undue prominence to the moment of birth. Certainly, lens maturation continues throughout life, and both congenital and acquired types could be either genetically determined developmental lesions or the result of environmental or extraneous influences. Therefore division into congenital and acquired types does not clarify the role of hereditary influence.

In discussing the congenital type, Krusius[26] and Verhoeff[27] related lenticonus to a delayed and abnormal separation of the lens vesicle from the surface ectoderm. Rones held that this theory was incompatible with the proven presence of a normal lens capsule and epithelium over the lesion. As an alternative, Rones suggested that lenticonus resulted from a disturbance of the pressure relationships in the maturing lens system. He supported this contention with observations on an 18-mm. human embryo which exhibited a biconvex defect between the normal lens epithelium and the developing primary lens fibers.

Seefelder and Wolfrum[28] described strikingly similar findings in a four-month-old human fetus, and offered abnormal lens development with excessive fluid intake from the tunica vasculosa as a basis for congenital lenticonus.

The acquired type with its usual onset early in adult life has been thought to reflect systemic disease,[6] metabolic disturbance,[14, 19] the pressure effect of a rigid iris,[1, 29] and aberrant[30] or absent[31] zonular fibers. Weakness of the anterior lens capsule has also

been cited as an important influence.[17, 29, 32]

The possibility of herniation of lens substance within the capsule is intriguing, though the complex circumstances postulated by Marsh in discussing posterior lenticonus would seem to be valid. He stated the necessity for a thinned, weakened but intact lens capsule, a more rigid supporting ring to form the margin, a contained mass sufficiently plastic to occupy the bulge without losing its optical lucidity, and pressure either within the lens or from without to form a displacement.

We cannot support or categorically refute any of these etiologic theories. Perhaps there are several types of anterior lenticonus, or, indeed, further study may reveal genetic predisposing and environmental or metabolic precipitating factors. We do suggest the possibility of trauma as an etiologic factor. Our patient had a contusion of the involved eye five years before the lesion was noted, and Ehrlich's patient recalled a fist blow three years before lenticonus was diagnosed. These two cases raise the question of a relationship between trauma and anterior lenticonus.

Only limited information is available concerning clinical course and evolution because of the variation in period of observations before case publication. Most commonly noted was the gradual increase in the lenticonus with progressive diminution in vision. This increase in the magnitude of deformity has been objectively measured by progressive increase in the axial myopic refraction.[32]

A further evolutionary stage was suggested by Feigenbaum. This author followed a patient with bilateral lenticonus for three years and noted gradual increase in the deformity. When seen again after a three-year interval, the right eye was unchanged, while on the left there was unilateral decrease in refractive error and subjective improvement in vision. Biomicroscopy showed that the lenticonus on the left was replaced by a dense subcapsular opacity at the same site and of the same size as the former protrusion.

Feigenbaum concluded that the increased capsular convexity at the anterior pole "caused the capsule to burst in one place resulting in a localized opacity, which means that a self-healing of the lenticonus took place." He postulated that the same sequence of events occurred in the earlier case report by Jaworski.

Jaworski's patient, a 32-year-old man, had bilateral anterior lenticonus. When seen after an eight-month interval, he was found to have a two-mm. opacity in place of the conus in the right eye. A similar opacity in the left lens was evident, though a small amount of protrusion persisted.

That such a capsular rupture could take place in anterior lenticonus was conclusively demonstrated by Ehrlich when he described a tear in the capsule at the summit of the conus and depicted underlying cortex protruding into the anterior chamber. Unfortunately, the lens became almost completely cataractous in Ehrlich's patient. It does seem, therefore, that spontaneous improvement may take place in anterior lenticonus.

Treatment of this disorder is imperative because of its severe visual impairment, bilateral incidence, and young age of occurrence. No prophylactic therapy is known. Refractive correction should be tried and often improves visual acuity, though lenses may be poorly tolerated.[21] Jaworski and Moulton noted that visual acuity improved with pupillary dilatation produced by semidarkness, and the latter's patient became habituated to atropine until an iridectomy was performed.

An iridectomy offers the advantage of insuring communication between anterior and posterior aqueous chambers in cases where inverse glaucoma is a theoretical possibility, while it may also simplify later lens removal. Most cases have not been complicated by extralenticular ocular pathology, so that successful lens extraction offers a good visual prognosis.

This discussion has made it clear that the etiology of anterior lenticonus is unknown. It has been further stated that clinical observations have usually shown a gradual increase in the lens deformity which may culminate in spontaneous rupture of the lens capsule. Treatment is indicated early in the disease when bilateral involvement is present and ranges from refraction and mydriasis to iridectomy and lens extraction.

Summary

1. Anterior lenticonus is defined and diagnostic features, as well as clinical incidence, are cited.

2. A case of unilateral, acquired anterior lenticonus in a 21-year-old white male is reported.

3. Consideration is given to etiology, clinical evolution, and treatment of this entity.

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BILATERAL METASTATIC CARCINOMA OF UVEAL TRACT WITH ORBITAL EXTENSION*

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REVIEW

Metastatic carcinoma of the choroid was first presented as a pathologic report in 1872 by Perls.[1] The patient was a 43-year-old man with a primary tumor of the lungs. The eyes were examined at postmortem and metastatic lesions were demonstrated in each eye. Since then the literature has been reviewed at intervals.

Devereux Marshall,[2] in 1897, first collected 22 cases and added two of his own. Krukenberg, Anderson, and Oatman[3] followed. Usher,[4] in 1923, found 30 bilateral cases out of 110 cases in the literature at that time. Few of these were proven by histologic examination. Finally, Lemoine and McLeod,[5] in 1936, in their review, found 229 cases of which 156 were histologically proved. The incidence of binocular involvement was 20.8 percent.

The reported occurrence in clinic patients varies from one in 30,000 patients, as reported by Uhthoff[6] in 1904; one to 150,000 by Sattler[7] in 1926; and one in 140,000 patients at Moorfields, reported by Stallard[8] in 1933. Michail[9] found only one in 48,000 eyes examined microscopically.

Metastatic carcinoma is the most frequently encountered secondary tumor of the eye. However, it is rare and only reported occasionally. Duke-Elder,[10] Mann,[11] and Greear[12] feel that this tumor is far more frequent than the literature indicates. Patients with cancer are not systematically examined for ocular involvement, for in most cases the patient is gravely ill. Some lesions are located precentrally and uveal metastases grow more slowly than metastases to the brain and other organs, thereby producing late diminution of vision.

INCIDENCE

The incidence of secondary ocular tumors in women is about two and one-half times that found in males. Wilder[13] reports that in the American Registry of Pathology there are 40 proven cases of which 28 are in females and 12 are in males. In five cases the ocular tumor was found before the primary tumor was suspected. The greatest number of cases occur in the 40-to-49-year age group, the second group being from 50 to 59 years, and finally, the last and least common is the 30-to-39-year group. Any cases in patients below 30 years of age and above 70 years are very rare.

PRIMARY SITE

The primary tumor site is usually the breasts in women and the lungs in men. Cohen[14] places the incidence at 70 percent, Usher[4] at 72 percent, Asbury and Vail[15] at 60 percent, and Giri[16] at 60 percent. However, Godtfredsen,[17] at the radium center and eye clinic of Finsen Institute in Copenhagen, showed that tumors in the lungs gave rise to

* From the Wills Eye Hospital. Read before the Section on Ophthalmology, College of Physicians of Philadelphia, March 19, 1953.

metastasis to the choroid just as often as did mammary carcinoma, although the latter were about 10 times as prevalent.

Baker's[19] studies support Godtfredsen series and they place the primary site as: 45 percent in the breast and 45 percent in the lungs, with 10 percent in other locations.

At Finsen Institute in a clinical study of 8,712 patients with carcinoma, only six were found to have metastasis to the choroid. This series included 1,287 patients with cancer of the breast, of which two had uveal metastasis, and 156 cases of cancer of the lung of which two had uveal metastasis. The alimentary tract is next with seven to 10 percent and, of this group, carcinoma of the stomach is responsible for about one half. Rarer isolated primary sites, such as the liver and the prostate have been reported.

Cordes[19] states that the general incidence of carcinoma of the breast is only 13.5 percent and this causes 50 percent or more of the uveal metastasis, while carcinoma of the stomach with a relative frequency of 36.5 percent gives rise to only 3.3 percent of uveal metastasis.

Other investigators have attempted to explain this statistical difference by postulating that certain tumors have a tendency to bloodstream metastasis, that in most cases of carcinoma some of the tumor cells enter the blood stream, but only rarely do the cells remain viable and grow at the new site. This ability to implant varies greatly and may even vary from time to time in the host. Mammary cancer cells are considered quite rugged and have the ability to survive under adverse circumstances.

Lemoine and McLeod[5] were able to find pulmonary metastasis in 83 percent of the cases that went to post mortem in their series. There is another way by which carcinomatous emboli can reach the eye and may account for metastatic lesions in which pulmonary involvement is not found. That is by the vertebral veins as described by Batson.[20]

Cordes[19] also quotes Ginsberg that the left eye is more frequently involved than the right, this being in agreement with the frequency of left cerebral embolism. The reason for this dominance lies in the directness of the left carotid arising from the aorta while the right arises from the innominate artery. Another interesting anatomic reason is given for the relative infrequency of choroidal metastasis—that it is due to the ophthalmic artery's branching at right angles from the internal carotid. Therefore, cancer cells in the blood stream are swept past the ophthalmic artery and are deposited in the brain and meninges.

Eye involvement

Neoplastic emboli almost without exception metastasize to the uvea, while bacterial emboli implant themselves in the retina in more than 90 percent of cases. Numerous theories have been advanced for this predilection for the uvea, the most feasible of which seems to be that the size of the emboli determines their position in the blood stream.

Bacterial emboli being smaller, are swept along by the swift central part of the current, while the larger neoplastic emboli move in the slower flowing periphery of the blood stream and, carried off into the smaller tributaries, reach the ciliary vessels and then move on to the uvea.

Within the uvea, choroidal involvement is more common than that of the iris and ciliary body by a ratio of 9 to 1. In Lemoine and McLeod's[5] series of 229 cases of uveal metastasis, the choroid was involved in 156 cases. The explanation of this is that the majority of emboli pass through the 20 or so short posterior ciliary arteries, rather than the two long posterior or the five or more anterior arteries. The site of selection is, therefore, the posterior region of the choroid, and, more specifically, the temporal side near the macular region where the short posterior arteries are larger and more numerous.

Clinically, after involvement, the retina appears elevated over a well-demarcated, pale-gray or yellowish-gray flat foci. This patch (or patches) increases in extent rather rapid-

ly. The retina becomes cloudy and opaque over the tumor and detachment soon occurs that will become complete.

The growth spreads in all directions but remains relatively flat, rarely being elevated more than two mm. Necrosis of the neoplasm may produce inflammation and secondary pigment changes which may confuse the clinical picture.

When the tumor involves the iris and/or ciliary body, the inflammatory element may be so pronounced as to involve the sclera and cornea and, if secondary glaucoma is present, the clinical diagnosis is difficult. If necrosis is present and at times is sufficiently toxic to produce inhibition of the adjacent tumor tissue, the ocular manifestations may be retarded. There is no neovascularization of the tumor but small hemorrhages do occur on the surface of the tumor.

An unusual tumor of the choroid, which was green in color, was reported by Bock[21] in 1883. This proved to be a metastatic lesion of a primary carcinoma of the liver. Bile, demonstrated in the tubules as biliverdin, produced the characteristic color.

Histologically, the tumor depends upon the nature of the primary growth and may be medullary, scirrhus, or adenomatous. Morphologic differences between the metastatic lesion and the primary tumor are recognized, but usually choroidal metastasis assumes the type of the primary cancer.

The tumor cells spread from their metastatic site in the lines of least resistance, along the lymph spaces and between the planes of the choroidal stroma, as described by DeLong.[22] The tumors seldom perforate the sclera or Bruch's membrane. Being confined to the choroid they produce the flat appearance already described.

Small hemorrhages and necrosis usually appear within the tumor. The necrosis may occur in relatively young metastases. Koyanagi[23] reported an unusual occurrence of a second growth, probably benign, arising from the pigment epithelium overlying a metastatic lesion secondary to a carcinoma of the lung.

The length of time elapsing between the diagnosis of the primary carcinoma and discovery of uveal metastasis varies from weeks to years. The longer periods reported were in Venco's[24] case of 14 years which was metastatic from a primary thyroid carcinoma, and in Sallmann's[25] case of 10 years, with the rectum being the site of the primary lesion.

Prognosis in uveal metastasis is poor. It has been reported that patients with unilateral lesions live a few years while those with bilateral lesions rarely live more than several months. However, several cases of bilateral metastasis have been reported in which the patients lived more than two years.

Treatment

Any treatment in these cases is not curative but only helps to maintain useful vision and relieve pain. Treatment for advanced cases is palliative.

Wilmer,[26] in 1928, reported a case with bilateral lesions that received radium therapy to both eyes. The patient died two years after the starting of irradiation and the vision was normal in the right eye and 20/200 in the left, the same as before the treatment. There was clinical regression of the metastatic lesions.

Uchermann[27] reported, in 1928, a similar case which was treated by X-ray therapy for four weeks with visual improvement in the left eye from perception of fingers at 10 feet to 5/50 and in the right eye from 5/50 to 5/10. Dr. Zentmayer,[28] in 1932, reported a similar case in which the bilateral lesions were treated with radium but the patient would not permit an adequate amount of radiation to be given.

Evans,[29] in 1937, reported a case in which radon seeds were used and the vision was maintained at 6/12 for two years and four months.

Cordes,[19] in 1944, reported a patient with bilateral metastasis whose left eye was enucleated and whose right eye received a total of 1,675 r to the right portal and 1,640 r to the left. Cordes' patient also received castra-

tion therapy, 1,000 r to two portals over her pelvis. The vision remained 6/6. Ten months later the field showed some changes and she was again given 3,346 r, measured in air at the skin and centered on the posterior orbit and 2,500 r were given through the left portal. The patient died 23 months after the choroidal lesions were discovered, but maintained useful normal vision throughout this time.

Case report

Miss B., a 56-year-old white woman, was first seen in the office of Dr. Mullen on May 12, 1951, with the chief complaint of eyes becoming tired while reading. Vision without correction was 6/6, O.D., and 6/12, O.S. which was corrected to 6/6 plus, O.U.

External examination was normal. Tension was 16 mm. Hg (Schiøtz) in both eyes. Incipient cataracts were also present binocularly.

The patient was next seen on August 6, 1952, at which time her chief complaint was gradual diminution of vision bilaterally over the two months prior to coming to the office. Vision this time was: O.D., 6/60; O.S., 3/60.

Ophthalmoscopic examination, O.D., revealed a hazy media and lenticular incipient changes. There was a large detachment in the lower nasal periphery to end at the 9-o'clock position. At this time there were no holes or tears visualized.

Examination, O.S., showed similar changes of the media. The nervehead was round, of good color, with a large detachment occupying the entire lower periphery. The macula showed some slight edema. No tears were seen.

During the examination, the patient volunteered the information that two months prior to the onset of diminution of vision she underwent a radical mastectomy for a tumor of the right breast at the University of Pennsylvania Hospital. The patient was immediately admitted to Wills Eye Hospital for study and treatment.

Findings upon admission were essentially the same as those seen in the office. In addition, there were found several masses on the scalp and a large cervical node on the right side. Roentgen examination of the chest was normal on August 11, 1952. Blood count and urinalysis were also normal.

Field examination showed marked contracture of both fields, O.S. greater than O.D. Transillumination was poor in all quadrants, O.D., and slight transillumination in the temporal half, O.S. Radioactive phosphorus studies were done on August 12, 1952, with the following results:

Radioactive phosphorus studies

One-half hour after 500 microcuries of radioactive phosphorus were injected into the vein, readings were taken. Using the ear lobe as normal tissue, uptake determinations were made on the various quadrants of the globes. Variation from the mean in normal tissues was: O.D., 120 percent; O.S., 110 percent, indicating abnormal tissue metabolism in both eyes.

The record of the right radical mastectomy performed on March 31, 1952, disclosed that numerous large lymph nodes had been removed from the axilla. Pathologic examination revealed extensive metastasis to all of the 24 lymph nodes removed. In addition, the lymphatic vessels coursing in the axillary fat contained numerous tumor emboli. Following convalescence, the patient received 26 X-ray treatments to the supraclavicular, axillary, and parasternal areas. Vaginal smears revealed no significant estrogenic activity and radiation to the pelvis was not done. The prognosis was considered unfavorable.

On September 4, 1952, roentgen studies revealed small confluent densities in both lung fields most marked in the lower lobes. Simultaneously, fever developed and the patient showed signs of respiratory embarrassment. She was transferred to Jefferson Hospital where her course was continually downward until she died on September 19, 1952.

Postmortem examination revealed exten-

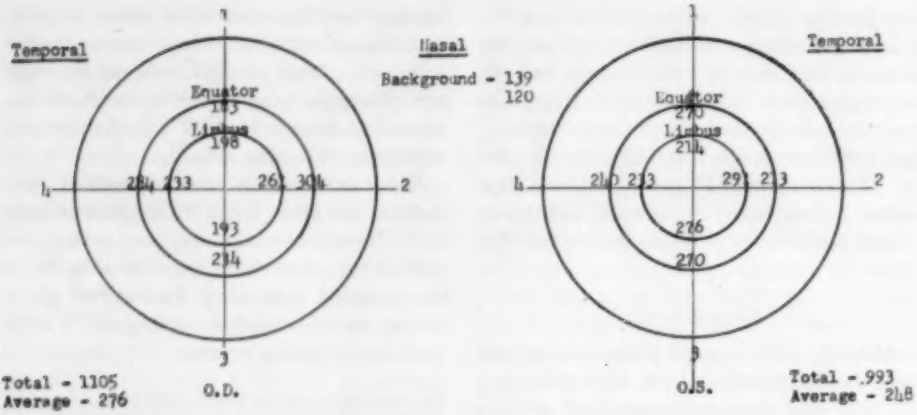

Fig. 1 (Mullen, DeLong, and Steinmetz). Concentration of radioactive phosphorus in the anterior half of the globe. Percent of variation from mean in normal eye is 139. Percent of variation from mean in pathologic eyes: O.D., 120; O.S., 110.

sive metastasis to the lungs, heart, spleen, liver, pancreas, adrenals, kidney, and brain. The eyes were removed together with the orbital content by block dissection through the roof of the orbits.

The globes were sectioned and gross examination, O.S., showed a flat choroidal tumor involving the entire posterior segment. The retina was completely detached. In the right eye, the picture was similar, with extensive involvement of the posterior segment and retinal detachment. However, the anterior segment was also involved, especially the ciliary body, with tumor cells breaking into the anterior chamber at the angle. The tumor cells were slightly differentiated with a suggestion of acinar formation and mitotic figures. Neoplastic emboli were found in the vessels of the retrobulbar tissues and the extraocular muscles of both eyes.

Summary

Another case of bilateral metastatic carcinoma to the choroid has been presented, with a brief review of the literature. Recent investigators have collected new statistics on the site of the primary tumor which differ from those in earlier reports.

The unusual aspects mentioned in the case herein reported were the binocularity, involvement of the anterior chamber, and multiple metastatic involvement of the muscle cones and vessels of the retrobulbar tissue.

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MANAGEMENT OF ACUTE OCULAR LIME BURNS

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Lime burns of the eye are always potentially destructive to vision as well as being extremely painful to the patient. One of us (W. Z. R.) recently treated four cases of this type of chemical injury with a method not previously described in the literature. Since the clinical results were most gratifying, we carried out some experimental work which indicates that this type of treatment is superior to other treatments in use at the present time.

CASE REPORTS

CASE 1

M. G., a 29-year-old white man, received a lime burn of the right eye while plastering on January 17, 1952. Irrigation with water was done immediately and examination approximately two hours later revealed marked staining (fluorescein, two percent) of the lower one third of the cornea with marked injection of the lower bulbar conjunctiva and inferior cul-de-sac.

He was placed on five-percent homatropine drops, three times daily, 10-percent sulfacetimide ointment, four times daily, five-percent Hydrosulphosol® in castor oil night and morning, vaseline pad and hot compresses for 15 minutes, three times daily. From January 17th to 22nd, there was no improvement.

On January 22, 1952, Hydrosulphosol® was discontinued and cortisone ophthalmic ointment (1.5 percent/gm. ointment base) every two hours while awake was begun in

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addition to the other medications. There was immediate improvement and on January 28, 1952, all treatment was discontinued. Final vision (without refraction) was 6/6, O.U.

CASE 2

T. B., a 22-year-old white man, received a lime burn of the right eye while plastering on December 29, 1951. He was treated by his family physician with five-percent neutral ammonium tartrate and a local anesthetic ointment without improvement and with considerable pain.

The first examination on January 8, 1952, revealed marked injection of the globe, both inferior and superior fornices, and a large, staining, superficial corneal ulcer involving the central two thirds of the cornea.

He was placed on one-percent atropine ointment, three times daily, 10-percent sulfacetimide ointment, four times daily, five-percent Hydrosulphosol® in castor oil, three times daily, vaseline pad, hot compresses for 15 minutes, four times daily, codeine and aspirin for pain, and a barbiturate at bedtime for sleep. There was no improvement from January 8th to 16th on this program.

On January 16th, 10-percent sulfacetimide was discontinued and polysporin ointment every two hours while awake was begun. On January 18th, there was no improvement so Hydrosulphosol® was discontinued and cortisone ointment (1.5 percent/gm. ointment base) every two hours while awake was begun.

There was immediate improvement so that in three days (January 21, 1952) the corneal ulcer was reduced approximately to one half its original size and, by January 30th, had disappeared; however, there was superficial, pinpoint staining and superficial scarring in the area of previous ulceration.

By February 14th, there was no corneal staining with only slight injection of the conjunctiva and all medication was discontinued. Examination on March 21st revealed a white globe with only faint, superficial corneal scarring. Cycloplegic refraction (five-percent homatropine hydrobromide) on this date was: O.D., +1.0D. sph., 6/6; O.S., −0.25D. sph. ⊂ +0.75D. cyl. ax. 170°, 6/6.

CASE 3

M. J., a 48-year-old white man, received a lime burn of the right eye while plastering on February 2, 1952. The first examination was made on February 9th, after he was treated elsewhere for one week with no benefit and much loss of sleep because of pain.

There was marked injection of the globe, moderate edema of the lids, and haziness of the entire cornea with a large, staining, superficial ulcer involving the nasal two thirds of the cornea.

Treatment was begun, using atropine, one-percent ointment, three times daily, bacitracin ophthalmic ointment 500 u./gm., and cortisone ointment (1.5 percent/gm. ointment base) every two hours while awake, vaseline pad, hot compresses for 15 minutes three times daily, a local anesthetic ointment for severe pain only, codeine and aspirin for pain, and a barbiturate for sleep.

There was immediate improvement so that by February 14th the ulcer of the cornea was reduced to one half the previous size. By February 21st, all corneal staining had disappeared, medications were gradually decreased and finally discontinued on February 29th (three weeks after first examination). During the course of treatment, the patient developed blepharoconjunctivitis due to atropine. This was treated with antihistaminics and ice compresses, after discontinuation of the other medications.

Final examination on April 12th revealed only slight, superficial scarring of the nasal one half of the cornea. Manifest refraction showed: O.D., +0.5D. sph. ⊂ +0.37D. cyl. ax. 75°, 6/6−1; O.S., +1.5D. sph., 6/60. A +2.0D. add gave J1, O.D.; no Jaeger type possible, O.S., which had been amblyopic all his life.

CASE 4

C. R., a 26-year-old, white man, received

a lime burn of the left eye while plastering on April 14, 1952. Examination revealed marked injection and staining of the upper and lower palpebral conjunctiva and nasal bulbar conjunctiva and marked deep staining of the lower two thirds of the cornea with two-percent fluorescein.

He was placed on cortisone ophthalmic solution (5.0 mg./cc.) and sodium sulfacetimide ophthalmic solution (30 percent) every two hours while awake, atropine (1.0 percent) ophthalmic ointment three times daily, vaseline pad, hot compresses for 15 minutes three times daily, and codeine and aspirin for pain.

There was immediate improvement so that on April 19th (five days) the corneal staining was reduced to one half of the original area. All staining had disappeared by May 3rd, 19 days after treatment was begun.

Final examination on May 24th revealed only faint, superficial corneal scarring in the area of previous corneal staining. Vision without correction was 6/6−1, O.D., and 6/12, O.S. Cycloplegic refraction (five-percent homatropine hydrobromide) showed: O.D., +0.75D. sph. ⊂ +0.5 D. cyl. ax. 85°, 6/6+; O.S., −0.25D. sph. ⊂ +1.25D. cyl. ax. 90°, 6/6−1.

Experimental data

I. Method

Experimental corneal burns were produced in rabbits with limed (calcium hydroxide). Approximately 500 mg. of calcium hydroxide USP (powder) were instilled directly onto the cornea of each eye of three adult rabbits on July 19, 1952. There was no corneal scarring present in any of the animals prior to the experiment.

A. *The lime powder* was rubbed thoroughly by rotating the lids. After a short period of time the conjunctival sac was thoroughly irrigated with normal saline, removing all of the foreign material. In Animal I, the lime was left for three minutes; Animal II, lime left for four minutes; Animal III, lime left for five minutes.

After thorough irrigation it was seen that there was a total, white, corneal opacity present in each eye in every animal. Fluorescein solution (two percent) was then instilled into the injured eyes and there was complete corneal staining in each eye, indicating complete epithelial loss.

B. Treatment was begun within 10 to 20 minutes of instillation of the lime powder and consisted of the following:

Animal I. O.D., 1.0-percent atropine SO_4, 10-percent sodium sulfacetimide ointment, and 1.5.-percent cortisone in lanolin ointment. O.S., atropine solution and sulfacetimide ointment.

Animal II. Treated as Animal I.

Animal III. O.D., 1.0-percent atropine SO_4, 0.5-percent terramycin ophthalmic ointment, 1.5-percent cortisone in lanolin ointment; O.S., atropine solution and terramycin ointment. All treatment was given three times daily.

II. Progress

A. *24 hours (July 20th).* All animals had marked photophobia, complete, white corneal opacification, and complete corneal staining.

B. *48 hours (July 21st).*

Animal I. O.D. (cortisone treated). There was definite regression in photophobia and the animal was able to open the eye and tolerate light; it could fix with the right eye. Figure 1 shows the noticeable decrease in corneal opacification. There was complete staining with fluorescein, but iris and pupil were easily seen, O.S. (no cortisone). Total, white, corneal opacification, marked photophobia, complete corneal staining, and no visible iris or pupil (fig. 2).

Animal II. The response was very similar to that in the first animal, with noticeable improvement of the right eye over the left. The only difference was the presence of a two-mm. white corneal opacity along the superior limbus from the 10:30- to the 1-o'clock meridian of the right eye.

Animal III. This animal likewise had complete corneal staining, O.U., and white opaci-

Fig. 1 (Rundles and Quinn). Right eye of Animal I 48 hours after cortisone treatment was started (July 21, 1952).

fication of each cornea. However, there was beginning peripheral clearing of the cornea, O.D., with no clearing, O.S.

C. *72 hours (July 22nd).*

Animal I. O.D., staining was now limited to the central cornea, 6.5 mm., horizontally, and 6.0 mm., vertically. O.S., complete corneal staining and complete corneal opacity.

Animal II. O.D., staining measured 7.0 mm., horizontally, and 7.0 mm., vertically. Iris and pupil were easily seen. The globe much less injected than that of the left eye. O.S., complete corneal staining and opacity.

Animal III. There was still complete corneal staining, O.U., but the corneal opacity, O.D., was somewhat smaller than on the previous day. O.S., as before with complete corneal staining and opacity.

D. *Four days (July 23rd).*

Animal I. O.D., corneal staining 6.0 mm., horizontally, and 6.0 mm., vertically. O.S., no improvement or change in cornea.

Animal II. O.D., corneal staining 5.0 mm., horizontally, and 4.5 mm., vertically. O.S., no corneal change or improvement.

Animal III. O.U., no change or improvement.

E. *Five days (July 24th).*

Animal I. O.D., corneal staining 3.5 mm., horizontally, and 4.0 mm., vertically. O.S., corneal staining complete with total opacity.

Animal II. O.D., corneal staining 2.5 mm., horizontally, and 3.0 mm., vertically. O.S., corneal staining complete with total opacity.

Animal III. O.D., corneal staining irregular, 5.0 mm., horizontally, and 8.0 mm., vertically. Corneal opacity practically gone; slight irregular central opacity. O.S., complete corneal staining and opacity.

F. *Six days (July 25th).*

Animal I. O.D., no corneal staining. Slight superficial scarring at superior limbus. O.S., complete staining and opacification.

Animal II. O.D., no staining except 1.0 by 1.0-mm. area just nasal to corneal center. O.S., complete corneal staining and opacity.

Animal III. O.D., corneal staining 2.5 mm., horizontally, and 5.5 mm., vertically. Opacity unchanged from previous day. O.S., Complete corneal staining and opacity.

G. *Seventh day (July 26th).*

No noticeable change in any animal except absence of any staining in O.D. of Animal II.

H. *Eighth day (July 27th).*

No change in any animal except for dis-

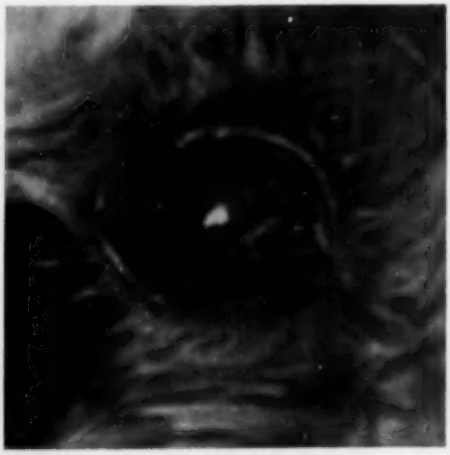

Fig. 2 (Rundles and Quinn). Left eye of Animal I 48 hours after treatment—but no cortisone—was started.

Fig. 3 (Rundles and Quinn). Right—cortisone-treated—eye of Animal I nine days after treatment was started (July 28, 1952).

appearance of corneal staining in O.D. of Animal III.

I. *Ninth day (July 28th).*

No noticeable change in any animal. Figures 3 and 4 show the appearance of both eyes of Animal I on this date.

J. *Tenth day (July 29th).*

The corneal staining in the noncortisone-treated eyes of all three animals first began to clear. No animals developed actual gross ulceration. Treatment was discontinued, O.U.

K. *Twenty-first day.*

Animal I was killed and both eyes were enucleated. Animals II and III were kept for three months, at which time Animal II was killed and both eyes enucleated.

PATHOLOGY REPORTS

Animal I (killed 21st day after treatment was begun).

A. *Left eye, no cortisone.* There is acute purulent inflammation in the supporting tissue of the subconjunctival region beyond the corneal margin and acute purulent keratitis with perforation. Saprophytic bacteria were present on the dead tissue. At the margin of the perforation, Descemet's membrane hangs freely into the anterior chamber. There is beginning fibroblastic proliferation but the anterior chamber contains much fibrinopurulent exudate. There is no inflammation of the retina or of any of the structures of the posterior part of the eyeball.

B. *Right eye, receiving cortisone.* There is trivial inflammatory infiltration near the corneal limbus. The cornea itself shows no significant inflammatory process and is intact. The anterior chamber is normal. The severe and destructive process found in the opposite eye is entirely absent.

Animal II (killed three months after treatment was begun).

A. *Left eye, no cortisone.* Healing corneal ulcer, now covered by stratified squamous epithelium which shows slight cornification. Beneath this epithelium there is maturing fibroblastic connective tissue. The original lesion appears to have gone about half way through the thickness of the cornea. At another level there is a small bleb elevating the regenerated epithelium from the underlying young scar.

B. *Right eye, receiving cortisone.* This also shows the healing of an ulcer which extended about half way through the thickness of the cornea. There is regenerated squamous epithelium over newly formed connective tissue

Fig. 4 (Rundles and Quinn). Left—noncortisone-treated—eye of Animal I nine days after treatment was started.

which is much less dense. The process of healing appears not quite so far advanced in this eye as in the left eye. There is also a slightly more active cellular infiltration which includes a few eosinophils.

Discussion

The use of cortisone locally appears to promote more rapid clearing of the stromal infiltration and opacification and to decrease the inflammatory reaction to the alkali faster than either Hydrosulphosol® or ammonium tartrate. Several investigations have revealed inhibition of epithelial regeneration.[1,2] However, our findings indicate inhibition of stromal inflammation, and thus much less scar tissue, but no retardation of epithelial regeneration. We feel that cortisone may even promote more rapid corneal epithelial regeneration.

There was no tendency to symblepharon formation in any of the reported cases or in the rabbit eyes. This is probably due to the known action of cortisone in delaying and reducing fibroblastic proliferation in inflamed tissue.[3,4]

No corneal vascularization occurred in the human eyes. This may have been prevented by the use of cortisone.[4,5] Vascularization was not included in the criteria used in the experimental data on the rabbit eyes.

Atropine relieves the irritative iritis and appears to contribute materially to the relief of pain. Since cortisone has no bacteriostatic property,[4] the use of a sulfonamide or antibiotic preparation to prevent secondary infection is essential. It appeared to make no difference in this small series of cases whether drugs were used in drop or ointment form. It must be noted that trapping of ointment beneath regenerating epithelial cells may, however, lead to later corneal erosion.[6] With this possibility in mind it might be better to use collyria.

Padding the involved eye until all corneal staining with fluorescein has ceased is indicated to control photophobia and to prevent movement of the lids over the cornea. Care should be taken to place a protective film of vaseline or similar substance on the pad surface in contact with the lids to prevent further corneal damage should the lids become separated beneath the pad.

Some local anesthetic preparation can be used if the pain is severe; this should be discouraged since excessive use may delay healing.[7] Codeine and some salicylate compound should be given to ease pain. Similarly, some barbiturate preparation should be given to promote needed rest. Moist heat in the form of hot compresses three or four times daily seems to promote healing and definitely helps to ease pain.

Most patients with chemical injuries can be ambulatory. However, if the burn is extremely severe, or if both eyes are involved, hospitalization is indicated.

Conclusions

The plan of treatment suggested for this type of injury is:

1. Immediate thorough irrigation with water at the scene of the accident. Neutralization of the alkali with weak acids should not be attempted since it may be harmful.[8]
2. Local cortisone every two hours while awake; as healing occurs, this dosage is reduced.
3. Sulfonamide or antibiotic preparations locally every two hours while awake; later reduced as is the cortisone.
4. Atropine (1.0 percent) three times daily; 10-percent aqueous neosynephrine can be used concurrently if pupillary dilatation is poor.
5. Involved eye padded, with vaseline or similar lubricant applied to under surface, until all corneal staining has ceased.
6. Moist heat three or four times daily until the eye is white.
7. Various local anesthetic preparations

can be used to help ease severe pain, but their use should be discouraged.

8. Codeine and salicylate drugs are prescribed to control pain and barbiturates to promote rest.

It is realized that the series of cases treated by this method is small and the experimental data are limited. However, the method described seems to be superior to those in use at the present time and definitely deserves more extensive trial.

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The authors wish to acknowledge the valuable assistance and co-operation of Dr. Carl V. Weller, professor of pathology of the University of Michigan Medical School, in performing the pathologic examinations on the enucleated rabbit eyes.

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THE FUNDUS IN TUBERCULOUS MENINGITIS IN CHILDREN*

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(Translated by Carlos J. Margarida, M.D., and Charles A. Perera, M.D., New York)

Geneau de Mussy (1837), Jaeger (1855), followed by Gerlach, Stelway, Mans, Froenkel, and Galezowsky (1866), studied the ocular fundus in tuberculosis and found miliary tubercles in the choroid in cases of miliary tuberculosis. De Bouchet and Tohnheim later made an interesting histologic study of these lesions. More recently, H. Lagrange (1924) and Bollach, Hillemand, and Laporte (1927), did work in this field.

All these authors, however, studied the ocular fundus in tuberculous adults. On the other hand, the present study concerns the ocular fundus in children with tuberculous meningitis and its role in the diagnosis.

During the course of several years, the ocular fundus in a large number of children of different ages was observed. These children, patients in Ward III of the Children's Hospital, were thoroughly studied and diagnosed as having cases of tuberculous meningitis.

The opinions formed following repeated examinations in each one of these patients have prompted this report which is based on the observation of 47 children with tuberculous meningitis, some of them without miliary tuberculosis and others with miliary tuberculosis. They were thoroughly studied clinically, radiologically, and by examination of the cerebrospinal fluid. The results of these studies clearly showed that it is neces-

* From the Department of Ophthalmology of the Children's Hospital. Presented before the Litoral Ophthalmological Society (Argentina), November, 1952.

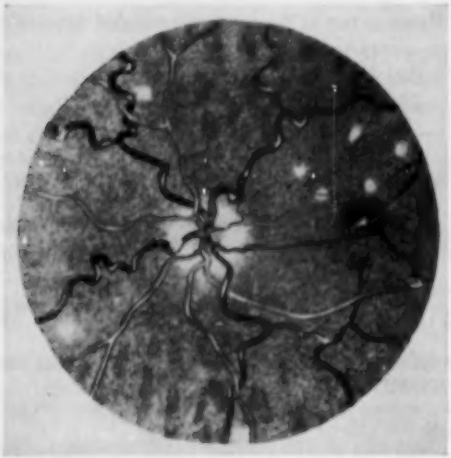

Fig. 1 (Saggese). Disseminated miliary tubercles of the choroid with congestion of the disc and tortuous veins.

sary to examine the ocular fundus carefully in every doubtful case in order to establish an early diagnosis of tuberculosis but that, even in cases which clearly show typical tubercles in the fundus, the ocular fundus will never serve to establish a definitive diagnosis of tuberculous meningitis without the aid of clinical, radiologic, and laboratory examinations that would support the presumptive diagnosis based on the fundus picture.

The interesting fact is that, when these lesions are found, they suggest immediately a miliary tuberculosis, or a tuberculous meningitis, or else, that the initial localized infection by the Koch's bacillus has disseminated or migrated, setting up other foci of infection in the child. It can also be stated that the tuberculosis localized in the ocular fundus is rarely primary and that it appears always in individuals with old tuberculous foci, or in those with actively progressive foci.

The ophthalmoscopic changes observed in the ocular fundus of every child with tuberculous meningitis, with or without miliary tuberculosis, are revealed as choroidal manifestations or as lesions of the optic nerve.

From what I have observed, it appears that the changes located in the optic nerve predominate over the choroidal lesions by four to one. I have also found that fundus lesions are less frequent in isolated meningitis than in meningitis accompanied by miliary tuberculosis.

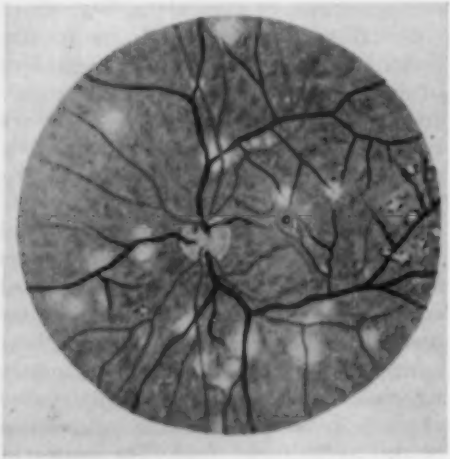

Fig. 2 (Saggese). Two types of miliary tubercles. Some are yellow and more or less pigmented; they belong to the first period of the disease. Others, white, thick, and blurred, are more recent. The disc is normal.

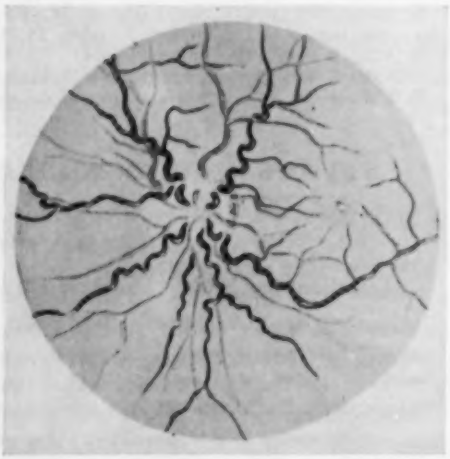

Fig. 3 (Saggese). Miliary tubercles of the choroid, with congestion of the disc. The veins are very sinuous; some of the bends disappear in the edema. The tubercles are crossed by thin vessels.

First will be described the chorioretinal lesions, which are always represented by the choroidal tubercles and which have varying aspects. It has been found that the so-called disseminated miliary tubercles are frequently bilateral. Initially, the lesions appear as light rose-colored or light yellowish spots, with blurred, slightly projecting edges and, in some cases, with a bright spot in the center.

The tubercles are few in number and can be easily missed because they are located in the periphery of the fundus. In general, they number two, three, or at the most four, and vary in size from one-fifth to one-fourth disc diameter. (One author reports finding a case with 26 tubercles in a single eye.) The tubercles are located beneath the retina which appears undamaged.

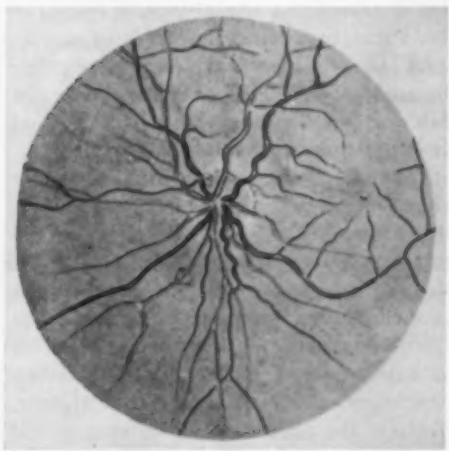

Fig. 4 (Saggese). The same eye as shown in Figure 3 five months later. The tubercles are thinner and slightly pigmented. In the papilla, red blurred edges indicate the remaining hyperemia.

In some cases there is only one large tubercle which has the same aspect as the miliary tubercles. They are found alone or together with miliary tubercles. They are large and generally measure one-half disc diameter in size but sometimes are larger than the disc itself. This solitary tubercle is frequently located at the posterior pole, some distance from the optic disc. It exhibits three concentric zones, the center being white with an areola of edema; the others are uniformly yellow in color with blurred margins. In a more advanced stage there is peripheral pigmentation.

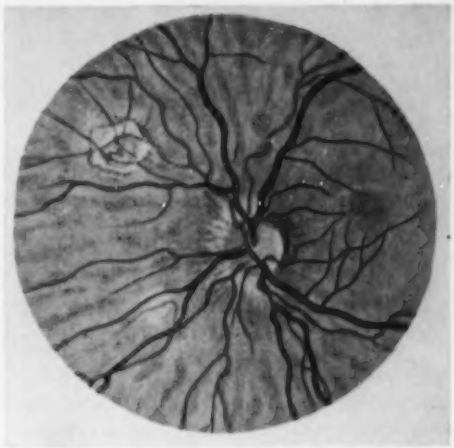

Fig. 5 (Saggese). Thick, solitary tubercle of the choroid, measuring one disc diameter in size, is yellowish in color with a spot in its center and peripheral pigmentation. A more recent and smaller tubercle is also present. The disc is hyperemic with peripapillary edema.

Choroidal tuberculomas are rare. I have found none in the examinations performed

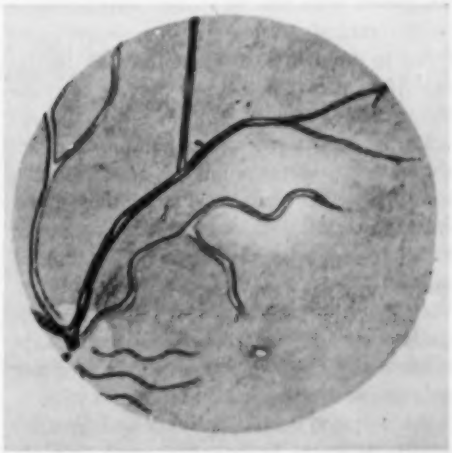

Fig. 6 (Saggese). Thick solitary choroidal tubercle with whitish blurred borders and yellowish center. It is furrowed by a vein. The papilla is normal.

Fig. 7 (Saggese). The same eye as show in Figure 6, three and one-half months later. The same tubercle appears more whitish, with clear pigmented borders and a pigmented spot in the center. The disc remains normal.

upon this series of patients. I can only say that some time ago I found a case of tuberculoma of the choroid in a child, aged two and one-half years, that resembled, by its appearance and size, a glioma of the retina. This case was published in the *Anales Argentinos de Oftalmologia,* volume 5, 1944.

Tuberculomas appear as projecting whitish masses with grayish shades and furrowed by the retinal vessels. They measure from three to four disc diameters or, as in the case just referrred to, they may occupy the entire globe.

Light punctiform spots with a pinkish shade, grouped or separated one from the other, are also found. Other authors have described black dots similar to the choroidal buttons (or beads) of Venemann but smaller in size, having the appearance of a nebula. Both types of lesions are unusual. I must confess that I have found neither, perhaps because my examinations were carried out only in children with meningitis.

As a last type of fundus lesion in these young patients, I want to report two observations which have not to my knowledge been described in the scanty literature dealing with the ocular fundus in children with tuberculous meningitis.

It is well known that the ocular fundus of a child reflects more light from the ophthalmoscope than does the eye of an adult. In the two cases observed by me, the reflected light was intense and the extent of the surface which reflected the light was extensive, giving the impression that the whole fundus was reflecting the light. It seemed as if the retinal vessels were traced over a white linen background. One of the cases, in particular, conveyed this impression.

The retina was normal but the choroid appeared to be completely replaced by a compact and homogeneous mantle. I believe this to represent a special type of lesion, or else a manifestation of hundreds of punctiform miliary tubercles that occupy the entire diseased choroid. This structure may act in this case like a mirror to the light, causing the bright appearance already described.

These two young patients died a few days after admission. Unfortunately, no autopsies are performed at the Children's Hospital and so I cannot speak regarding the cause of this picture, and must simply present the facts as such, subject to discussion and scientific speculation. However, these findings lead me to believe that if, during routine ophthalmoscopic examination in febrile, or afebrile, children, the fundus shows an exaggerated and extensive light reflection, help should be sought from the epidemiologist in order to uncover any existing tuberculosis.

In addition to the findings already described nerve lesions may be present. These lesions are more common than the choroidal ones. They range from simple hyperemia of the optic nervehead to congestion, to papilledema, and even to optic-nerve atrophy. I have most frequently found hyperemia of the disc, with normal peripapillary vessels. Next, and in order of decreasing frequency, are elevation of the disc with very tortuous vessels, the characteristic papilledema, and, finally, optic-nerve atrophy, only one case of which I have found.

The evolution of the ophthalmoscopic changes already described can be halted when the proper treatment is given these young patients. Streptomycin is the main medication in this treatment. I have seen tubercles in varying forms remain stationary and even regress.

The color of the tubercles is modified, as are their edges and the appearance of pigment in their periphery. Depigmentation of the chorioretina at this stage of the disease corresponds to definite destruction. When regression of the tubercle occurs, the borders, formerly blurred, become clear, the edema diminishes and then disappears. Later on, the whole lesion tends to decrease in size. In the cicatricial stage only a pigmented spot remains.

The optic-nerve lesions also change under treatment. Mild hyperemias and edemas frequently disappear completely in one to three months. The more marked congestions and edemas regress more or less completely, but in a much longer period of time.

As a consequence of the ocular fundus lesions already described, there are modifications in the light reflex, modifications in the intrinsic and extrinsic motility of the eyes, certain degrees of amblyopia, changes in the appearance of the gaze, and so forth.

The tuberculous lesions of the ocular fundus have such a characteristic appearance that they should cause no confusion. If there is any doubt as to the stages of development, the condition might be confused with syphilitic choroiditis. In tuberculous choroiditis, however, the retina is undamaged, since it becomes involved and diseased only secondarily and in a late stage. Vision then suffers. On the other hand, in syphilitic choroiditis, the retina is involved early, becoming a chorioretinitis, and vision is implicated early, and numerous complete scotomas are exhibited.

Regarding treatment of this condition, local therapy to the eye is not employed because the lesions are only influenced by systemic therapy of the primary tuberculous meningitis. The patient should be placed under the care of the epidemiologist.

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ESSENTIAL ATROPHY OF THE IRIS*

A HISTOPATHOLOGIC STUDY

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DEFINITION

Essential or idiopathic atrophy of the iris is a rare, progressive, unilateral, sporadic, vascular disease of adult life; females are predominantly affected. Among its characteristics are: patchy loss of the entire thickness of the iris with hole formations, distorted and migrating pupil, and secondary glaucoma. The glaucoma is secondary to outflow obstruction from cuticular membranes and anterior synechias, and from lost capacities for fluid exchange by the iris.

CLINICAL COURSE

Clinical evolution is remarkably characteristic. The history is free from episodes of injury or primary inflammation. A composite description of the clinical course follows:

The onset is gradual, without pain or signs of inflammation. The patient becomes aware of a slight change in the shape or

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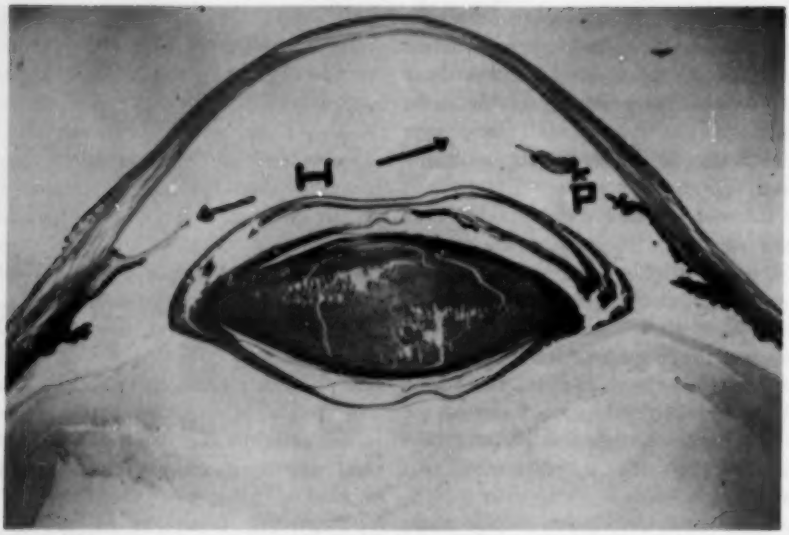

Fig. 1 (Heath). 49-497. Anterior segment. (H) Large hole. (P) Markedly displaced pupil.

placement of the pupil of one eye. Over a period of two to 18 years, with an average of about five, progressive displaced pupil and hole formations develop in the iris.

The refractive errors in the cases studied have not materially changed. This indicates that the cornea and lens are not markedly affected in early stages. Visual acuity is disturbed by marked pupil displacement and hole formations but is seriously impaired by secondary glaucoma. The latter is delayed an average of five or six years, with the shortest period being one year and the longest over 10 years.

Fundus examinations in early stages return normal findings, apart from the iris changes. Successive biomicroscopic examinations clearly show patchy atrophies of the iris. These are progressive in nature with the pupil secondarily displaced and marked by incomplete pigment ectropion.

By gonioscopic examination, anterior peripheral synechias are seen in later stages beginning on the side of the displaced pupil. A mass of iris tissue is seen, applied to the cornea on the side toward which the pupil is displaced. The synechias travel from this point around the angle.

As the defects in the iris are noted to progress, transillumination shows the patchy or regional loss of substance to be larger in area than suspected by direct inspection.

Glaucoma gradually appears, ordinarily of a low order at first. The complications of glaucoma develop more rapidly and require earlier treatment in some cases. A distinct subgroup of essential iris atrophy exists, typified by early appearances of glaucoma with corneal edema. As described later, this group is distinguished by cuticular membrane formations.

A variety of surgical and radiation therapies have been employed in this disease. Successful treatment has not been the rule. A few cases have been reported clinically before glaucoma has been established.[1, 2]

Theories relating to etiology

A considerable number of theories have been offered with the various published cases; only a few reports have followed microscopic examinations. Some of the latter follow. Feingold[3] (1918) suggested that the atrophy of the iris was caused by a con-

genital vascular disturbance of the smaller iris circle; and the glaucoma was caused by irritating effects of degenerating tissue. Licsko[4] (1923) found hyalin degenerations of the iris vessels, as did Feingold. He explained the glaucoma by pigment release from the atrophic iris and by the loss of surface for resorption of intraocular fluid.

Bentzen and Leber[5] reported that the glaucoma caused the iris atrophy (1895). Rochat and Mulder[6] thought that the formation of anterior synechias pulled the iris toward that point, causing tearing and atrophy, progressing to loss of the anterior-chamber angle and obstruction with consequent glaucoma. Larson[7] (1920) projected the idea that the iris atrophy was a consequence of some unnamed developmental anomaly, beginning with corectopia. deSchweinitz[8] related the cause to iris abiotrophy (1926).

Kreiker[9] (1928) suggested that the embryonic processes underlying the resorption of the pupillary membrane became active, extended in adult life, and brought about resorption of iris tissue. He reported that the glaucoma rose from occlusion of the chamber angle due to detritis from broken-down iris structures.

Waite[10] (1928) ascribed the atrophy of the iris to mechanical stretching which brought about a narrowing and occlusion of the iridic arteries leading to nutritional loss. Waite postulated that primary changes occurred in the mesodermal portion of the iris due to a contraction and reduction in size of the lumens of the radial arteries with loss of nutrition in that segment. As for the elevated intraocular pressure, he believed a likely explanation to be the loss of capillaries in the iris with an atrophy and reduction of resorption capacity.

Von Grosz[11] (1936) believed that an heredity feebleness of the iris was due to a hypothetical neurogenic gene. A group of other reports ascribe the iris atrophy to chronic iridocyclitis.

Blood supply of the iris

Before considering the histopathology found in this series of examples of progressive iris atrophy, some comments will be made on the blood supply of the iris.

The earliest vessels of the iris to form are

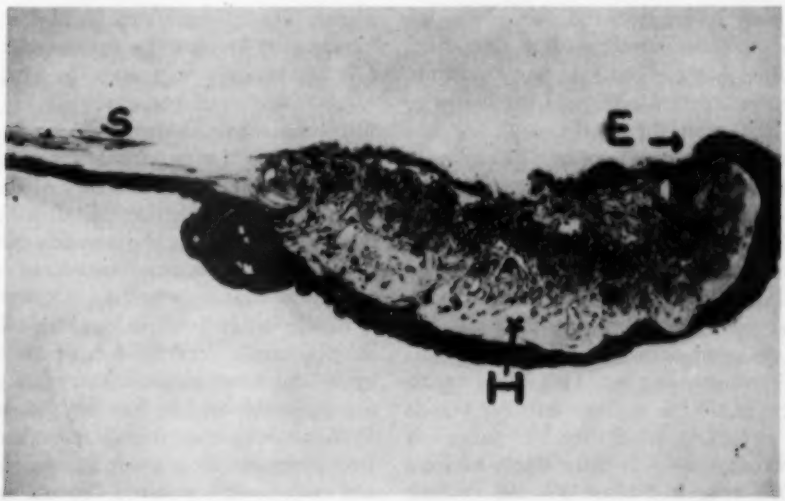

Fig. 2 (Heath). 49-497. Surviving sphincter. (E) Ectropion uveae. (H) Subsphincter plexus, hyalin formation. (S) Atrophic stroma and lost dilator.

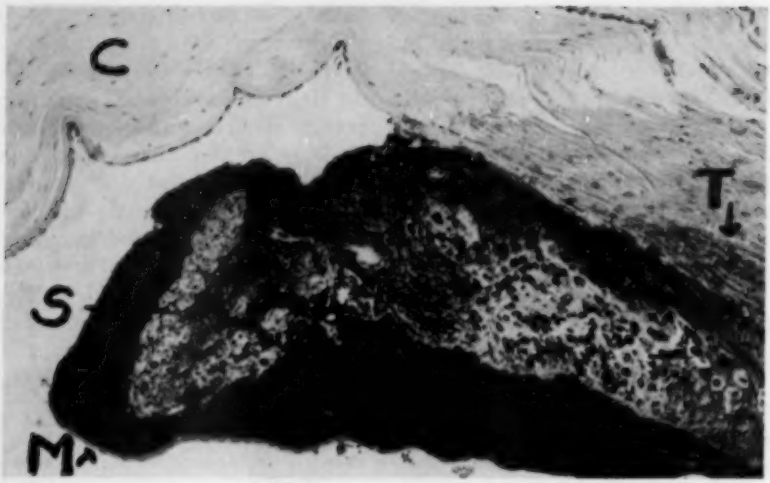

Fig. 3 (Heath). 49-170. Collapsed, folded iris, primary synechia. (C) Cornea. (T) Trabeculum. (S) Sphincter. (M) Membrane.

part of the pupillary membrane derived from branches of the long ciliary arteries. The anterior group enters into the large arcade vessels of the pupillary membrane; the middle branch passes into the iris stroma; the third turns posteriorly into the ciliary body region.

By the seventh month the most anterior set of vessels, arteries, and veins form the net and vascular arcades of the pupillary membrane. Longer coursing vessels within the stroma create a plexus of capillaries to supply the sphincter of the pupil. A subsphincter plexus, mostly of capillaries, lies in front of the myoid and the pigment layers, and supplies them and the subsphincter zone.

The central and second arcade of pupillary vessels become atrophied up to the anterior leaf of the zig-zag line by full-term time. The surviving first anastomosing arcade becomes the lesser circle of the iris and remains an arteriovenous channel. This minor vascular circle of the iris contributes some vessels to the stroma in adult life. The pattern is brought out clearly in early stages of iritis when the congested blood columns and the contributions from the minor circle again become obvious. At this time in irises with scanty pigment, two or three layers of vessels, can be seen running toward the pupillary margin, the superficial ones supplying the stroma and anastomizing with the lesser circle.

That the iris is richly supplied with blood vessels and capillaries is best appreciated when many sections are cut in various planes. The collections of blood vessels are loosely bound together by various thicknesses of supportive fibrous tissue. The loose structural design of the iris permits rapid motility. Sustained thickening during dilatation and thinning during contraction must have some effects upon the efficiency of the blood vessels. It is possible that the normally thick, stiffened walls of the blood vessels of the iris are functionally important to resist kinking and mechanical occlusion.

Reactions from injuries, traumatic and surgical, from retained foreign bodies and cysts, and from glaucoma, together give us a considerable insight into the panorama of vascular disease of the iris. We can learn that occlusions in a group of vessels cause but very limited atrophy. The normal elaborate anastomosis apparently limits the effects of occlusion. Also in the iris much

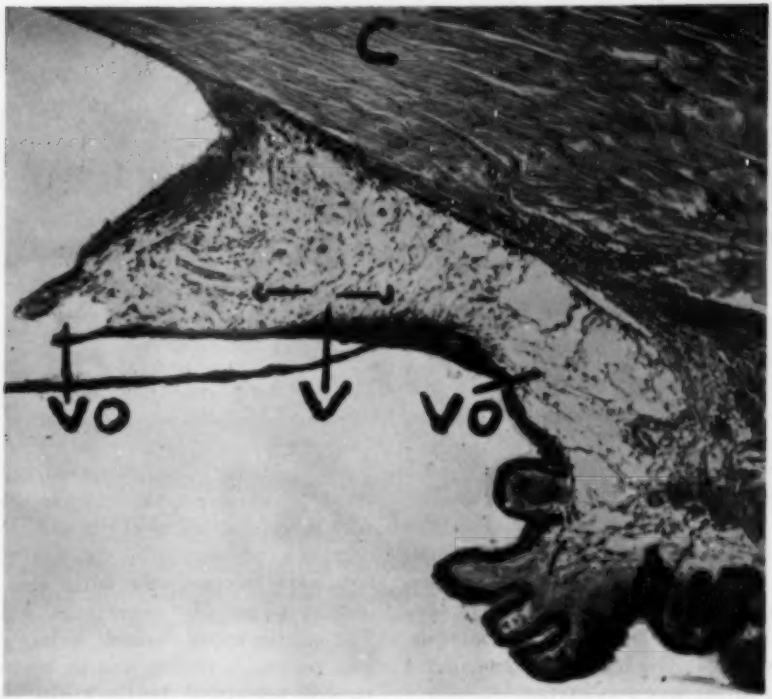

Fig. 4 (Heath). 52-61. Surviving iris, synechia. (V) Vessels nearly occluded but still functioning. (VO) Occluded vessels, iris lost. (C) cornea.

fibrosis of repair is atypical unless lens substance, extensive hemorrhage, or both are present. In late glaucoma, free from inflammation, an over-all atrophy of the iris and ciliary body is seen, but the pigment layers and intrinsic muscles survive to the last.

Secondary iris atrophies

Among the many causes of secondary atrophy of the iris are: glaucoma, senility, and recurrent inflammation. They only superficially resemble the essential progressive type.

Secondary atrophies are characterized by signs of inflammation and repair—cells, extensive pigment displacements or proliferations, hemorrhages, and newly formed blood vessels. Cuticular membrane formations are rare. The secondary types of atrophy are principally referable to causes other than vascular occlusion. When occlusions are present, these have limited effects and are nonprogressive.

The atrophies present a different pattern. In the principally affected zones, some blood vessels survive. The sphincter is often lost, especially this is true with the senile secondary atrophies accompanied by glaucoma. The limited extent of the atrophy or its overallness in either case may show distortion but rarely displays migration of the pupil opening. And ectropion uveae, while common in secondary atrophies of the iris, are due to anterior membranes and are usually completely around the pupil border.

Materials for this study

The materials for this study of progressive iris atrophy consist of the eyes from five patients in the Eye Pathology Laboratory of the Massachusetts Eye and Ear In-

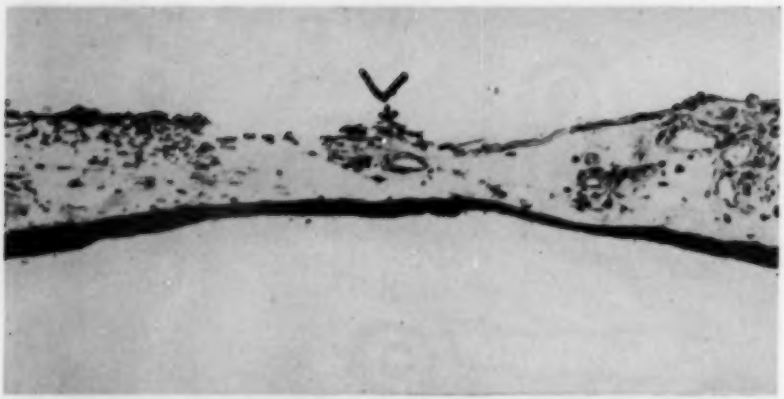

Fig. 5 (Heath). 49-170. (V) Surviving island of iris stroma with patulous vessel.

firmary* and clinical histories. Correlations were made with the histopathology found in five examples of this disease from the Armed Forces Institute of Pathology.† Serial sections were made in some; in many, various planes were cut. Routine and special stains, with and without depigmentations, were employed. The iris of a latex-injected stillborn infant was also studied.

Histopathology

The histopathology is primarily distributed to the iris and ciliary body, and follows the complicated anastomosing vascular system. This engenders a spotty atrophy because anastomoses supply blood when medium and small vessels are closed off. But when the changes about to be described attack a main vessel like the great arterial circle, a net of capillaries, or a group of communicating blood vessels, then the region supplied becomes atrophic since no round-about channels are available to supply blood.

The smaller arteries and capillaries showed marked reduction in lumen diameters with hyalin thickening of the walls. Various degrees of closure up to complete obliteration were common; the latter seen at the borders of atrophic zones (figs. 5 and 6). The arteriovenous channel, or lesser circle, was regionally closed, and in other places showed subintimal hyalin thickening with collections of fatty cells. In one specimen, the great arterial circle in the head of the ciliary body was occluded completely and replaced by hyalin (fig. 10). Usually, surviving iris tissue could be correlated with apparently functioning vessels.

Another rarely found capillary change consisted of a collection or knot of endothelial cells apparently occluding the lumen beyond which the slightly thickened and otherwise normal wall collapsed (fig. 8).

A relative absence of hemorrhage indicated that arteries and the arterial side of capillaries were closed with resultant anemic infarction. A slow evolution of necrosis would be expected in the richly vascularized anastomosing system. When a large vessel —the large circle—becomes occluded, the result no doubt is to speed the progress of the atrophy. A complete occlusion of the major circle was found in only one case (fig. 10).

Considering the histopathologic material

* Massachusetts Eye and Ear Infirmary, Eye Pathology Laboratory. 6-10,021; 9-12,531; E-49-170; E-49-497; E-52-61. I am grateful to Dr. Louis Goman of Saginaw who supplied two specimens and to Dr. P. Jewett of Worcester, Massachusetts, who supplied one.

† From the Armed Forces Institute of Pathology the following cases were studied through the kindness of General deCoursey, director, and Mrs. Wilder, pathologist: 57,865; 27,355; 66,298; 84,236; 162,225.

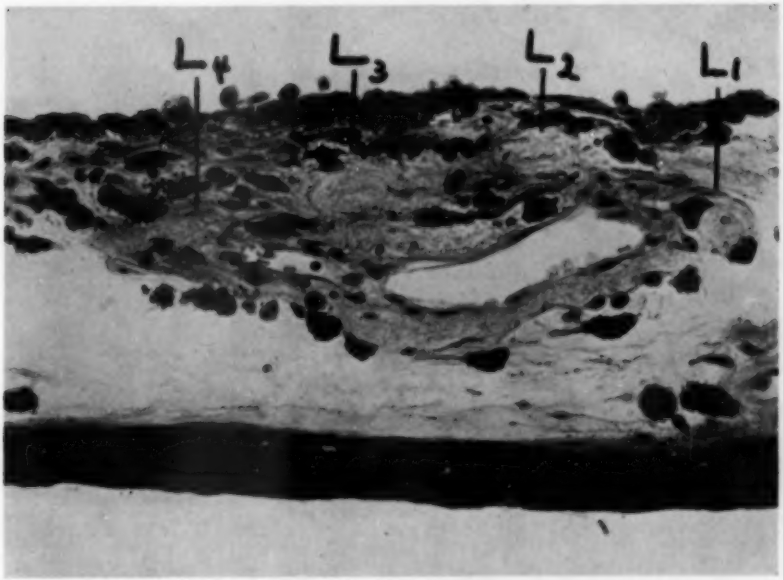

Fig. 6 (Heath). 49-170. Lumens of iris vessels decreasing directionally into complete occlusion and a zone of atrophy—(L_1 to L_4).

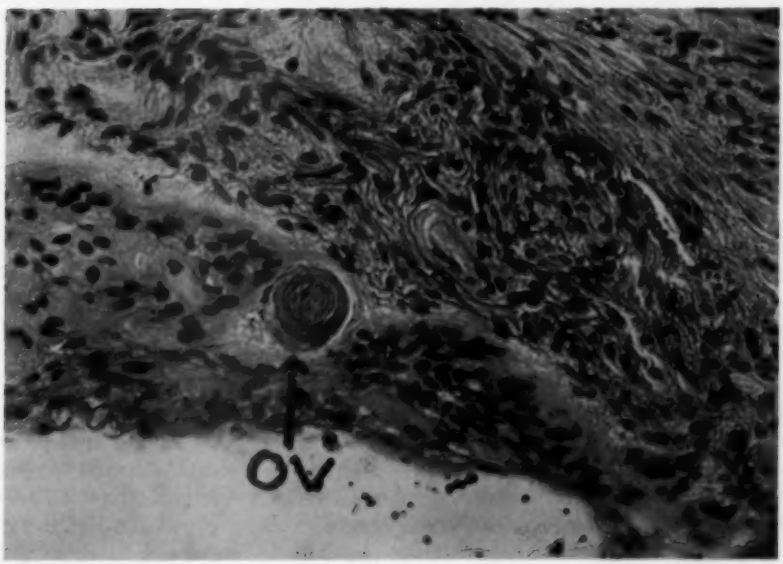

Fig. 7 (Heath). 49-170. Bleached. (OV) Complete occlusions of vessel supplying dilator.

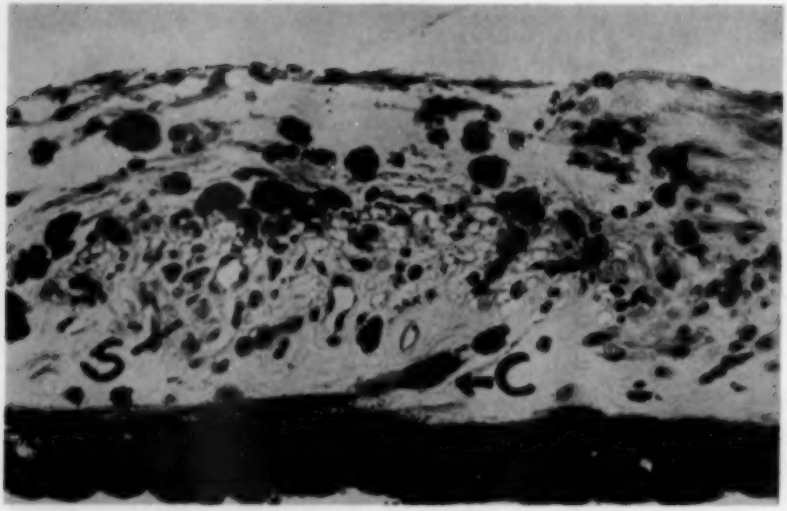

Fig. 8 (Heath). 49-170. (C) Capillary at point of endothelial proliferation and occlusion. (S) Atrophic sphincter.

in a group, the atrophy was distributed to parts and to the entire thickness of the iris in zones, and was regionally dependent upon the duration of the process and the collective effect of multiple occlusions. The sphincter usually escaped until the last and often it stood out, surviving with a supplying artery and capillary plexus (fig. 2). Fatty degenerative changes in the sphincter were related to closures and hyalinization of the supplying capillary plexus. The dilator myoid especially suffered from anemic infarctions, following spotty hyalinization up to the point of complete closure of the supplying capillaries. Varying degrees of fragmentation up to complete loss were noted (figs. 5 and 7).

One would expect the blood vessels of the ciliary body to display similar occlusions and secondary atrophies in some cases; in other words, the process in the iris probably extends outside to closely related ciliary vessels. This has occurred (figs. 14 and 15). The vessels affected are the branches from the long ciliary arteries which turn into ciliary body. These branches are mainly distributed to the anterior and middle third of the ciliary muscle wedge. The fractional losses of the ciliary body resemble those of the iris except, unlike the latter, evidences of fibrous repair can be found in later stages.

In general, the distribution of occlusions, hyalin thickenings, and exaggeratedly reduced calibers of the vessels were found to be spotty. One would expect necrosis to be slow in evolving because of the hyalin nature of the changes in the vessel walls, the scattered distribution, and the rich anastomosis normally present in the iris blood supply.

An attempt was made to trace the vascular patterns of the iris in an infant. A stillborn fetus was injected with latex. The injection mass collected unevenly with an elaborate regional distribution in small vessels and capillaries while some of the larger vessels were relatively free (fig. 16). This illustrates somewhat the pattern made by the vascular disease of progressive atrophy.

Where the supplying arteries and capillaries have survived in the progressive atrophy specimens, the iris stroma and muscles have survived (figs. 2 and 6). In one case, the pigment layer of the iris displays, in regions of still functioning vessels, intra-epithelial cysts (fig. 13). In zones

Fig. 9 (Heath). 52-61. (V) Subintimal thickening, major vascular circle of iris.

where the pigment epithelium is lost and in points of partial loss, the bordering capillary plexus is mostly or completely occluded. When the supplying vessels are partially affected, and with very small lumens, the pigmented epithelium shows vacuolization.

Close correlation is consistently noted between survival of various iridic tissues and patency of what are thought to be supplying arteries and capillaries. The absence of hemorrhage and signs of cellular inflammation are noteworthy and to be expected in anemic infarction.

When the progressive occlusions have been distributed chiefly to one sector or half of the iris, the pupil is distorted and the sphincter is usually pulled away from this side. Thus, the initial bunching-up of tissues is found on the least affected side.

Here the iris is folded somewhat and forms a substantial mass of tissue in contact with the cornea (fig. 3). Anterior synechias are begun from this point (fig. 4). Where the distribution of the atrophy is in quadrants, the pupils may assume a square shape and remain relatively centrally placed.

Cuticular membranes, well endowed with endothelial cells, were clearly demonstrated in five cases of the 10. These membranes were found to extend from the cornea over the sclerocorneal trabeculum, and over the synechias, when present (fig. 11). The membrane took a modified Hotchkiss stain (fig. 12). The location of the membranes clearly suggested a cause for an early appearance of glaucoma.

It is possible that the clinical variety of progressive iris atrophy which shows in early stages corneal edema and glaucoma is a cuticular membrane type. Judging from this series, about one third of the patients fall into this category. The cuticular membrane type displays multiple vascular occlusions; and whatever formulates vascular endothelial activity and hyalin collections may equally stimulate corneal, trabecular, and iris endothelial growth and cuticular membranes.

Other parts of the eyes showed secondary participation in the glaucomatous part of the disease. In the retinas of late stages, loss of ganglion cells was the rule, but they were well represented in the early cases. The

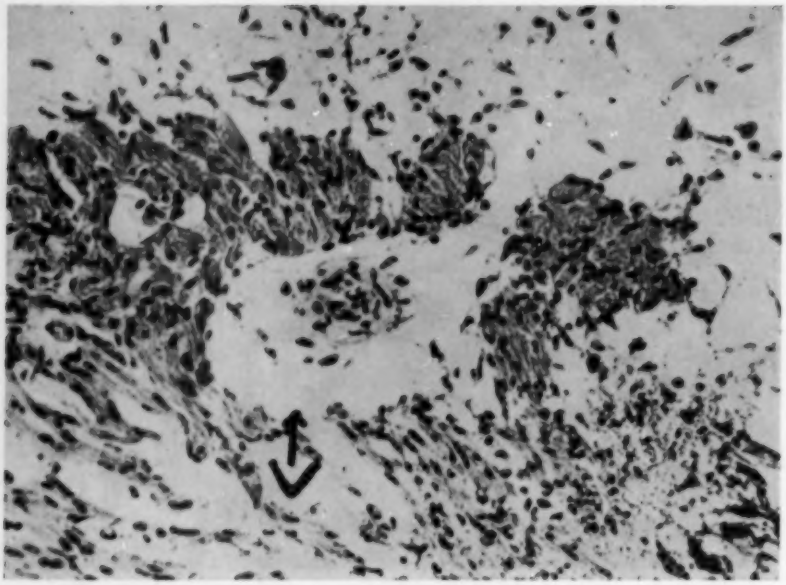

Fig. 10 (Heath). 52-61. (V) Complete occlusion of major vascular circle of iris.

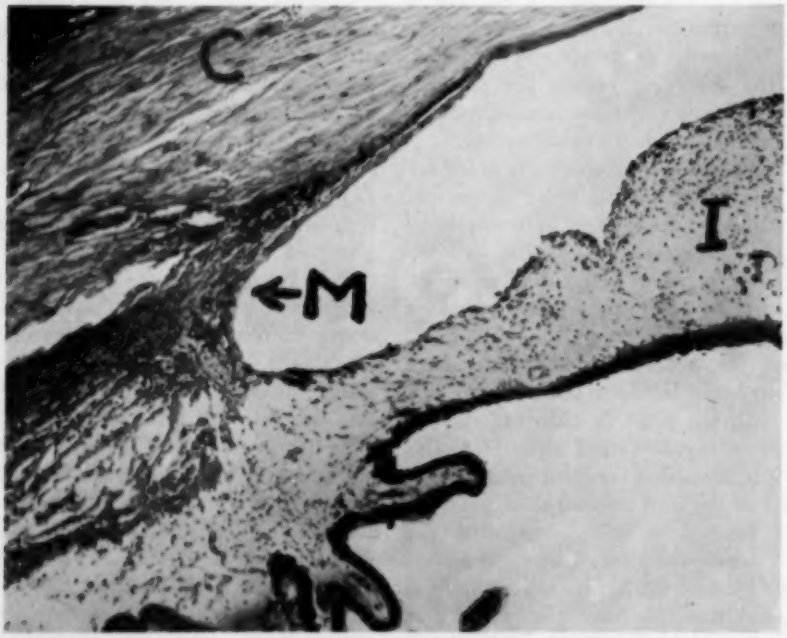

Fig. 11 (Heath). 52-61. (M) Endothelized cuticular membrane lying over sclerocorneal trabeculum. (C) Cornea. (I) Iris. The glaucoma was early, nervehead not cupped; the retina and ganglion cells were intact.

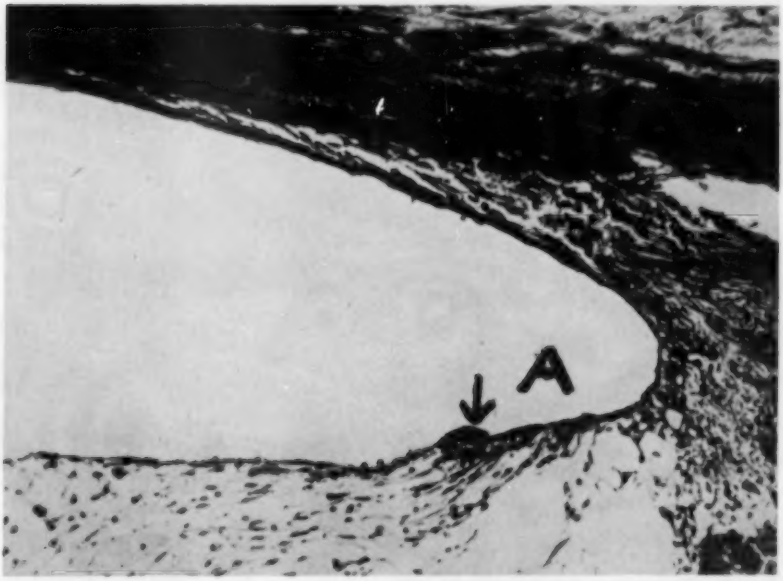

Fig. 12 (Heath). 52-61. Cuticular membrane heavily tinted by Hotchkiss stain. At (A) is the thickened advancing head of the membrane.

optic nervehead also escaped cupping in the early cases. Occlusive vascular disease was not notable in the choroid or in the short ciliary vessels. Careful study of many sections of the vena vorticosa showed no atypicality. The ciliary ring in the late stages of the disease showed advanced glaucomatous atrophy. Segmental atrophies related to vascular occlusive disease were found affecting the middle layers of the muscle ring in the early cases.

The corneas showed a tendency to collapse and undulate, and otherwise were affected by the secondary glaucoma. The endothelium was not found to be especially disturbed except as described—by contributing toward cuticular membrane formation. One case had a small onyx in the cornea. The anterior chambers proved to have irregular depths, due partly to corneal collapse and partly to synechia.

Shift of the pupil

The dilator myoid has an aggregate power considerably more than the sphincter, as has been found by tests of isolated strips of each (Heath and Geiter[13]). The linear efficiency of the dilator exceeds that of the sphincter. Whereas the dilator myoid is a thin sheet, it is broad, and its orientation gives it a great advantage over the sphincter. The sphincter covers linear distance by contracting pi times per linear unit. The regulating dilator need cover an equivalent distance by contracting or relaxing only one unit.

The dilator has an advantage for linear movement over the sphincter of 3.1416 to 1. Consequently, with substantial atrophy of the stroma and the dilator on one side, the functioning or opposite side shifts the pupillary sphincter toward itself (figs. 1 and 2). A study of the holes in the iris correlates well with the shift of the pupil toward the functioning side. The result is a bunching of iris tissue at the base of this side (figs. 1 and 4).

Ectropion uveae

Incomplete ectropion uveae is often noted clinically and is found in sections. The in-

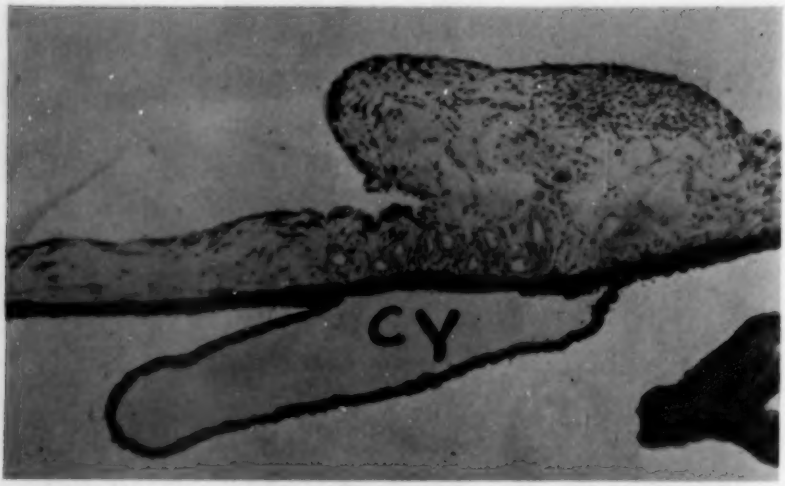

Fig. 13 (Heath). 52-61. (CY) Intra-epithelial cyst, only present when fed by a group of functioning vessels.

complete ectropion uveae is explained by the joint effects of the sphincter and dilator. The partial ectropion of the uvea is found on the side of the defective dilator. No doubt the ectropion results from the mechanical force of the sphincter where unopposed by the dilator; the unanchored pupil border is pulled forward with the uvea. This maneuver is assisted by hyalin formations under the sphincter (fig. 2).

Secondary glaucoma

The joint occlusive activities of cuticular membranes and of synechias would seem to make glaucoma inevitable, even in the presence of a limited atrophy in the ciliary body. The shifted and bunched iris becomes a mass of tissue, which of necessity projects anteriorly and makes corneal contact. Thus the anterior synechial pattern is begun.

Another source of glaucoma is related to the iris itself. The iris is capable of picking up a high percent of particulate matter from the anterior chamber. Wandering cells carrying phagocytized material migrate into the iris with great ease and travel actively or passively within the perivascular membrane about the vessels.

An iris undergoing destruction by autolysis after anemic infarction supplies a considerable amount of material which must go somewhere or be collected in depots. Its usual channels of exit through the iris are destroyed. This detritis is unable to escape through the trabeculum of the angle. It accumulates—some in cells, some loose and amorphous. From this are created additional blockades of outflow.

Cuticular membranes, endowed with endothelial nuclei, are clearly seen in the sections made from moderately advanced cases of progressive atrophy. They occupy the inner sclerocorneal trabeculum, the iris remnants, or run over the synechia and on the back of the cornea with different degrees of participation in each. In one case a cuticular membrane separated the trabeculum from a synechia. The physiologic function of the iris in removing crystalloids, plasmoids, and particulate matter is progressively lost by atrophy, and this in turn contributes toward glaucoma.

The glaucoma in this series is represented by various stages, early and late, and its role as a complication is clearly demarcated. As compared to the glaucoma, the corneal, ret-

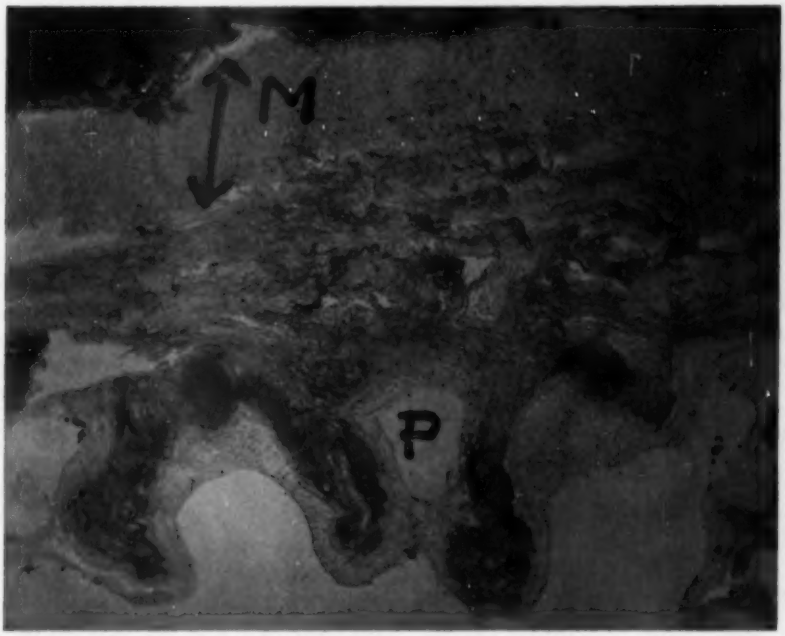

Fig. 14 (Heath). Ciliary body bleached. The central muscular zone (M) is atrophic because the supplying blood vessels are occluded. The processes (P) are relatively normal, supplied by unaffected vessels.

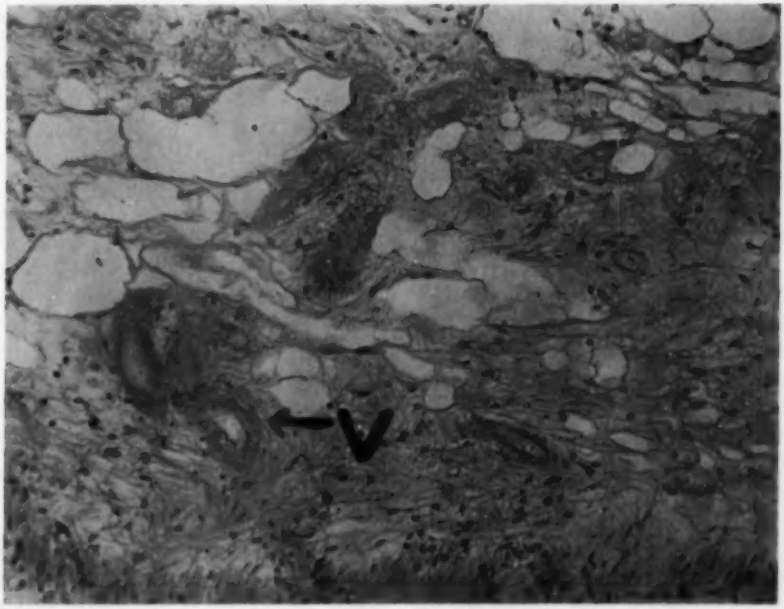

Fig. 15 (Heath). Bleached ciliary body, surviving hyalinized vessels (V) passing through an atrophic region, the latter supplied by occluded vessels. Numerous fatty lipophages are present.

Fig. 16 (Heath). 49-92. (V) Latex-injected iris vessel supplying dilator and stroma. (SV) Vessel running parallel at this point with different origin, probably destined for the sphincter region, is free from injection mass. Adjacent vessels in the iris may have different origins and different destinations.

inal, optic-nerve changes, and possibly the cataract formations are all secondary complications. Disseminations of pigment from the iris are too often found in laboratory material, unrelated to glaucoma, to be considered important in progressive idiopathic atrophy of the iris as a cause of glaucoma.

Summarizing discussion

The histopathology found in the relatively early stages of progressive iris atrophy, before destructive effects from late glaucoma have occurred, indicates that the mechanism for the atrophy lies in multiple anemic infarctions, following segmental vascular occlusions. The cause or causes of the localized vascular changes remain unknown.

The occlusions were somewhat randomly arranged in the several systems of iris vessels, arising from the long ciliary artery, and extended inward so that successively more stroma and iris tissues were lost. The occlusive phenomena were seen in all sizes of arteries and capillaries. Furthermore, the over-all narrowing of the lumens of the arterioles found in surviving portions of the iris reduced the amount of blood allowed to pass through and apparently stepped-up the velocity of atrophy. However, the surviving portions of the iris show vessels numerous enough to keep the tissue viable.

Where the atrophy is most marked and but few fibrous strands remain, the blood vessels have disappeared or have become completely hyalinized. Where blood vessels are functioning, and only where patulous, some evidence of overactivity is suggested by separation of the posterior pigment layers into intra-epithelial cysts. The clinical course and pathologic manifestations seen in sections correlate well with the distribution of the atrophy.

The shift of the pupil occurs toward the functioning meridian when, in the opposite meridian, the dilator is atrophic or lost. This also is identifiable clinically by zones of atrophy or holes, as seen by transillumination. The shift of the pupil ring is in the plane of action of the surviving dilator because of the latter's greater over-all efficiency in making linear movement. A bunching-up of iris tissue at the base of the surviving side subsequently makes contact with the cornea and forms anterior peripheral synechias.

The frequency of demonstrable cuticular membranes found in over a third of the cases suggests that this is an important factor in glaucoma and explains the early manifestations of glaucoma in some cases. These have been called the "cuticular-membrane types." Endothelial cells are viable and well represented over the membranes.

Incomplete ectropion uveae is explainable by the rolling-out effect of the sphincter where unopposed by the dilator. It is usually present in late stages.

Two features of the disease cannot be explained, namely, predominance in adult females and unilaterality. Among the clinically reported exceptions is a bilateral case in a five-year-old boy (Fine and Barkan[13]).

The glaucoma phase of the problem is recognizable as a complication of the primary iris disease. The increased intraocular pressure can be due to one or combination of the following: cuticular membrane, synechias, cellular detritis, and trabecular block. A further possibility exists that the glaucoma is related to reduced capacity for absorption by the iris because this tissue is largely lost. The unilaterality is not explained.

The fact that females are chiefly afflicted suggests that some endocrine mechanism plays a part in the primary occlusions of the iris arteries and capillaries.

Conclusions

These studies were made from the histopathology found in 10 cases exhibiting early and late stages of the disease. As in previous studies, females were chiefly afflicted. This disease of adults is unilateral, of spontaneous origin, and exhibits glaucoma as a complication of a primary progressive disease. Secondary glaucoma may appear in early stages which are characterized clinically by corneal edema and increased intraocular pressure before advanced atrophy of the iris occurs. This type of progressive atrophy is characterized histologically by cuticular membrane formations.

Idiopathic progressive iris atrophy (essential) is caused by readily demonstrated multiple vascular occlusions, which progressively create anemic infarctions and loss of iris tissue in all layers. The ciliary body is similarly, but regionally, affected in some cases.

The cause or causes of the local changes in the blood vessels remain unknown. Vascular closures are demonstrable in both iris arteries, capillaries, and in the lesser and greater circles of the iris. These sporadic manifestations are somewhat like those seen in the spleen. Subintimal hyalin thickening and lipid-cell accumulations were commonly found. Occlusions of capillaries occurred from endothelial cell plugs and the iris is especially vulnerable to nutritional impairment from the reduced size of lumens because of already existing thickened walls.

The glaucoma of progressive essential atrophy of the iris is explainable on four grounds involving principally decreased facility of outflow:

1. Partial coverage of the sclerocorneal trabeculum by cuticular membranes.
2. Peripheral anterior synechia.
3. Loss of the resorption capacity of the iris from actual loss of iris tissue.
4. The blockading effect over the angle from iris debris and detritis.

The absence of inflammatory cell changes is explainable, as is the clinical course, by anemic infarctions. Close correlations are noted between clinical course and the histopathologic findings.

No genetic patterns were found in the cases studied.

243 Charles Street (14).

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VITREOUS ASPIRATION

And replacement with cerebrospinal fluid

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Report of a case

History. Mr. J. B., a mason, was plastering a wall nine-feet high, five years ago, when he lost his balance, fell the nine feet, and hit his head on a rock. He lost consciousness for 10 to 20 minutes. Soon after he noticed spots before his right eye. There was a progressive loss of vision in the right eye until only light perception remained. There was no history of past illnesses or operations. The family history was not relevant.

Present examination. The lids were not swollen and the conjunctiva was not inflamed. No keratic precipitates were found in the cornea. There were midstromal opacities and scars from old foreign-body injuries. The pupils reacted to light. No cells were seen in the anterior chamber. The lens of the right eye showed snowflakelike opacities arranged around the 6-o'clock position.

Fundus examination. The vitreous of the right eye showed a black reflex and a dense mass. There were no red reflexes when the patient was asked to move his eye up and down. Under the slitlamp, one could see yellow fibrin masses that moved as the eye moved. No hemorrhages or red masses could be visualized. It was not possible to see the retina or nervehead.

The nervehead of the left eye was normal in color. Physiologic cupping was present. The vessels showed no changes and there were no pathologic changes in the macula and retina.

Vision was: R.E., good light projection; L.E., 20/20. Tension was: R.E., 23 mm. Hg (Schiøtz); L.E., 27 mm. Hg.

Study under Euophthalmine. When the pupil of the right eye was widely dilated, only the black reflex could be seen. No fundus details could be visualized. Transillumination with the bulb of an ophthalmoscope showed no areas of shadow. Light came through the pupil when the bulb was held in the different quadrants.

The following note was made at this time: "Believe the poor vision in the right eye is due to vitreous hemorrhage."

Laboratory data. Blood count: hemoglobin, 14 gm. percent; RBC, 4.54 million; WBC, 9,500; polymorphonuclears, 53 percent; lymphocytes, 37 percent; eosinophils, four percent. Corrected sedimentation rate was 0.3 mm. Hematocrit was 50 percent. Total proteins, 6.2 gm. percent. Urinalysis was negative. State Hinton was negative. Two stools were negative for blood and parasites. Chest and sinus X-ray studies were negative. X-ray studies of the right eye for intraocular foreign bodies were negative. Tuberculin test was negative.

Preoperative diagnosis. Vitreous hemorrhage of the right eye.

Indication for operation. Loss of vision, right eye.

Operation. The patient was admitted to the Boston City Hospital on April 14, 1952.

Preoperatively, he was given sodium amy-

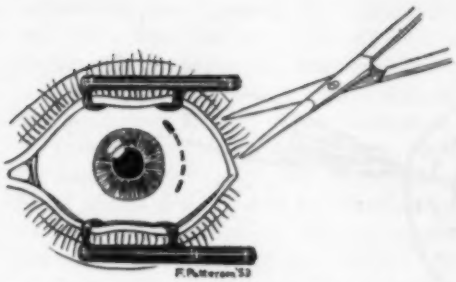


Fig. 1 (Deutch). The incision should be made in the outer upper quadrant.

tal (3.0 gr. at night and again at six in the morning. Demerol (100 mg.) was ordered for 7:00 A.M. at which time four-percent cocaine (three drops in the right eye every 10 minutes for one hour) was started.

Akinesia was accomplished by injecting 6.0 cc. of 1.5-percent Monocaine combined with epinephrine around the upper and lower lids. Ten cc. of Monocaine was injected toward the top of the ear, downward in the direction of the cheek, and finally upward toward the temporal bone. One cc. of the same medication was injected in the retrobulbar region.

After the eye speculum had been placed, a suture was passed through the superior rectus muscle and tied so that, with the aid of a small hemostat, the outer upper quadrant (fig. 1) of the eye was in the proper position for surgery. The conjunctiva was lifted and dissected from the sclera eight mm. from the limbus in the region of the pars plana of the ciliary body and was lifted out of the way by means of a suture placed through its edge.

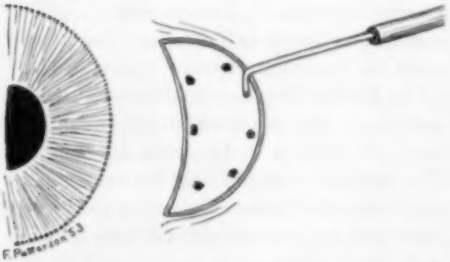


Fig. 2 (Deutch). Diathermy punctures are applied to prevent retinal separation.

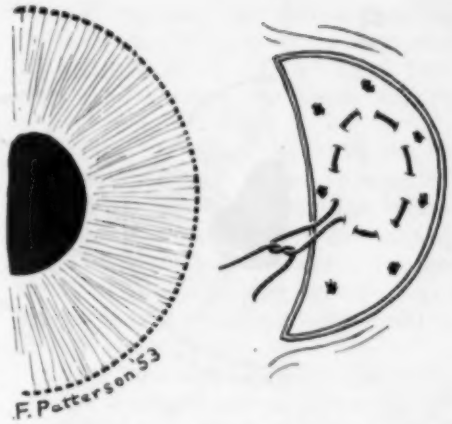


Fig. 3 (Deutch). A purse-string suture is placed inside the circle of diathermy punctures and tied loosely with a single knot.

Diathermy punctures (fig. 2), as for retinal detachment, were applied in a circle to prevent later separation of the retina. A purse-string suture (fig. 3) was placed inside the circle and tied loosely with a single knot.

In the center of the circle, a small incision (fig. 4) was made with a von Graefe knife. It did not penetrate the sclera but went through about two thirds of its thickness so that an 18-gauge needle could easily be passed into the vitreous cavity.

Great care was taken to direct this needle backward in order to avoid the lens but not

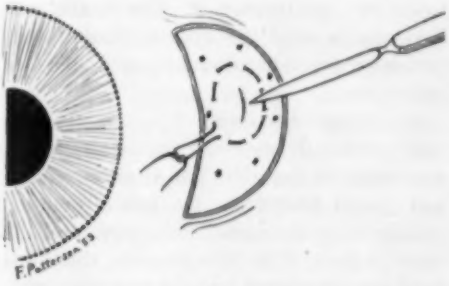
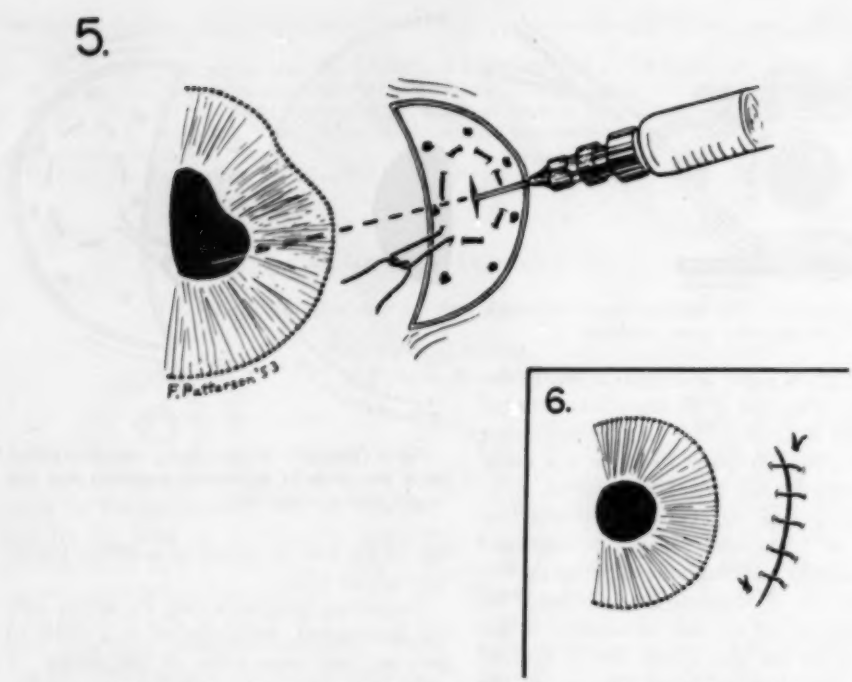


Fig. 4 (Deutch). An incision through two-thirds of the sclera makes it easier to introduce the syringe needle into the vitreous cavity.



Figs. 5 and 6 (Deutch). (Fig. 5). Aspirating the vitreous. (Fig. 6) The incision is closed by continuous sutures.

so deep as to hit the opposite side of the retina. The needle could be seen behind the lens when the spinal fluid was introduced.

About 1.5 cc. of thick yellow vitreous (fig. 5) became visible in the syringe. It was not black or red in color as had been expected. It looked very much the same as opaque glass. It was translucent to light but one could not see through it. The needle was held steady until the eyeball became soft, care being taken to prevent injury to the lens and retina.

A syringe containing 1.5 cc. of spinal fluid previously obtained from this patient was ready on the table. The vitreous syringe was pulled free from the needle and the syringe with the spinal fluid was carefully fitted in place. With little pressure, the spinal fluid was introduced into the vitreous cavity. As the needle was gently removed from the posterior chamber, the assistant tied the purse-string suture. The conjunctiva was closed with continuous 4-0 black-silk sutures (fig. 6). Atropine and penicillin ointments were applied to the right eye; penicillin to the left. Double eyepads and a black mask were used.

Progress notes. On April 17th, two days after operation, the patient showed photophobia. The lids were swollen and there was pericorneal injection. There were folds in Descemet's membrane but no blood in the anterior chamber. A fundus reflex could be seen but no details of the retina. The patient could see the doctor's face.

On April 20th, the lids were still swollen and there was pericorneal redness. Folds were still present in Descemet's membrane. The anterior chamber had formed and the pupil was well dilated. The retina and its vessels could be seen and the vitreous opacities were less marked.

By April 22nd, the eye was less inflamed and the lids less swollen. Photophobia and

lacrimation had decreased. The conjunctiva was still injected and there were still folds in Descemet's membrane. The anterior chamber was clear; the pupil dilated. Opacities of the lens were noted at the 6-o'clock position. As the patient moved his eye, large floaters could be seen in the vitreous. The retina and its blood vessels could be seen indistinctly. The sutures were still in place. The patient, who did not complain of pain, could see the face of the doctor. The patient was discharged from the hospital to be followed as an office patient.

When seen on April 24th at the office, vision was 20/100, with no improvement by pinhole. The upper lid was swollen. There was pericorneal injection and folds in Descemet's membrane. The anterior chamber showed a four-plus flare. There were many posterior synechias around almost all of the pupillary area. The lens opacities, previously noted, were still present. The vitreous opacities were less dense and the dense black reflex had given place to large black masses that floated in the vitreous as the eye moved. The nervehead, the vessels, and the retina could be visualized. The patient was placed on 30-percent sodium sulfacetimide ointment three times a day, and acetyl salicylic acid and acetophenetidin and codeine were prescribed.

Five days later, April 29th, the patient had so much pain that he could not sleep at night. Acetyl salicylic acid and acetophenetidin with codeine (0.5 gr.) and Seconal (1.5 gr.) were prescribed and the pain subsided so that the patient could get some rest.

The conjunctiva was markedly injected. There were folds in Descemet's membrane but no keratic precipitates could be seen. The four-plus flare was still present in the anterior chamber and posterior synechias still held the dilated pupil to the lens.

It seemed to me that the iritis was due to the foreign-body reaction initiated by the spinal fluid; however, it may have been caused by infection so an antibiotic was ordered. The following medication was administered: Cortone, 300 mg. for the first day in 75-mg. doses every six hours; 200 mg. the second day, 50 mg. every six hours; then 100 mg. daily, 25 mg. every six hours. Penicillin (400,000 units) was injected into the deltoid muscle each day.

By May 5th, vision was 20/70 and the conjunctival injection seemed to be subsiding The cornea showed luster. The folds in Descement's membrane were less marked. The anterior chamber showed a one-plus flare. The vitreous clouding showed signs of clearing and the retina and vessels could be seen more clearly.

A week later, May 12th, vision was 20/60. The eye was quiet and the patient did not complain of pain. The conjunctiva was less injected and the cornea was clear. No flare was present in the anterior chamber and the vitreous showed signs of further clearing. The nervehead, vessels, and retina could be seen indistinctly.

By June 3rd, vision was 20/40. The eye was quiet and the patient had gone back to work. No Cortone had been used for three weeks, and all treatment was withdrawn. The conjunctiva was white, the cornea clear, and the lens opacities around the 6-o'clock position were about the same as noted before operation. The vitreous showed coarse floaters and appeared to be quite fluid. The nervehead, vessels, and retina could be seen.

Discussion

When this patient was first seen by me, five years after the fall which resulted in progressive loss of vision in the right eye, I learned that he had been hospitalized soon after the injury and that he had received a course of intravenous typhoid therapy, starting with five million and ending with 40 million organisms. He was also given vitamin C, one gm. five times a day. When the patient was discharged at the end of 10 days, there had been no objective or subjective improvement in vision.

While I was waiting for the transcript of this hospital record, Dr. Joseph Igersheimer saw the patient in consultation. Vision at this time was good light projection only, and

there was a black fundus reflex. Dr. Igersheimer said that he had had two patients who were benefited by vitreous aspiration and replacement with saline. He suggested that such a procedure be tried on my patient and consented to assist me.

In view of the report by Arruga that it is practical to replace vitreous with spinal fluid and of Landegger that an eye from which he had removed vitreous and replaced it with spinal fluid did much better than eyes in which saline had been substituted, and because the physical and chemical properties of vitreous and cerebrospinal fluid are similar, it seemed wiser to use spinal fluid instead of saline. And this was done in my case as reported herein.

According to Arruga, the best prognosis for vitreous replacement is in cases of vitreous hemorrhage due to trauma. The question arises, however, how long one should wait for the hemorrhage to absorb before attempting the replacement.

It is known that absorption of hemorrhage from the vitreous may be long delayed but may clear after many months. Professor Zur Nedden advises waiting 10 days for traumatic hemorrhage to clear. Cordes, on the other hand, believes that it may take a year to absorb completely.

In some cases, the hemorrhage may clear eventually; in other cases, however, vitreous bands and retinitis proliferans may develop with disastrous results to the eyes. Once hemorrhage is organized, it cannot be aspirated.

It would seem that conservative treatment should first be attempted. This might consist of fever therapy for, according to von Sallmann, short bouts of fever produced daily for 18 days accelerated the disappearance of red cells from the vitreous. Injection of thyroxin seemed to cause a more rapid clearing of the vitreous in the later days of the treatment. Thyroidectomy performed on young rats slowed the absorption of red cells from the vitreous.

For years, saturated solution of potassium iodide has been used in cases of vitreous hemorrhage with little effect. Cortone, systemically, is now being tried and it may be that it will help to prevent formation of the fibrinous bands and the retinitis proliferans which may complicate hemorrhage in the vitreous.

If, after a waiting period of six months, the hemorrhage has not absorbed spontaneously and the conservative forms of treatment have failed, the operative procedure herein reported should be tried.

It is not difficult to remove up to two cc. of vitreous and replace it with an equal amount of spinal fluid. For the experienced ophthalmologist, it is easier than a cataract extraction. And there is a possibility that vision may be improved, as it was in my case —from light projection only to 20/40.

Conclusion

This report is offered with the hope that it may persuade other ophthalmic surgeons to treat vitreous hemorrhage by aspiration and spinal-fluid replacement in order that this operation may be evaluated in the light of the results in many more cases. Further experience may make it possible to add this procedure to the eye surgeon's armamentarium and thereby restore sight to those who would otherwise be visually handicapped.

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EXPERIMENTAL EVALUATION OF HYDROSULPHOSOL®*

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The first report published on the experimental evaluation of Hydrosulphosol®, as applied to laboratory animals, is that of Harley.[1] In his study, he used a standard minimal burn which he produced by a variety of chemical agents: hydrochloric acid, sodium hydroxide, maleic anhydride, acetic acid, iodoacetate, sulfuric acid, cresol, lactic acid, and calcium oxide. He then compared the results obtained in Hydrosulphosol-treated animals with those obtained in untreated control rabbits.

Our study differed from his in two main respects:

First, instead of using minimal standard lesions, we used maximal lesions, which because of their severity could not be as accurately standardized. This was done because of our clinical experience during the period of this work.

It was found that of 24 consecutive alkali burns of the eye, serious enough to require admission to the hospital, only two resulted in blindness. In fact, those two resulted in loss of the eye. The remainder of the cases resolved with nothing more serious than small marginal opacities, or small easily corrected symblepharon.

The only treatment given was the use of an antibiotic to combat secondary infection, the use of a mydriatic to protect the iris, and, in 12 cases, the use of cortisone to try to suppress the amount of necrosis, scarring, and vascularization. In the great majority of cases, it was impossible to carry out the preferred treatment of early copious irrigation, and epithelial denudation, as described by McLaughlin.[2] This is because our cases were not industrial, and first-aid was not uppermost in the mind of the patient at the time of the burn.

The second way in which our study differed was that, instead of using many different forms of chemical trauma and then one method of therapy, we used only one method of burning the cornea and tried several forms of therapy.

All of our burns were made the same way—by direct application of solid sodium hydroxide. Then the animals were divided into five groups:

I. A control group which underwent no treatment.

II. A group treated by the topical application of Hydrosulphosol.

III. A group treated by the topical application of cortisone ointment.

IV. A group treated by the subconjunctival injection of reduced glutathione.

V. A group treated by the subconjunctival injection of cortisone suspension.

METHOD

At first we produced, and followed, a series of burns made by the intralamellar injection of sodium hydroxide, as described by Meyer and Jones.[3] This, however, did not produce lesions severe enough to match those of our clinical cases in which the eyes were lost. Since that was the type of case in which we were most interested, another method was sought. The routine finally adopted was as follows:

Rabbits weighing approximately 3,000 gm. were used. Pontocaine was instilled into the cul-de-sacs. The lids were held open and, when the nictitating membrane was finally withdrawn, the flat side of a lentil of solid sodium hydroxide was held in contact with the center of the cornea for one second. The rabbit was then allowed to close its eyes.

This resulted in a roughly standard irregularly rounded lesion of about five-mm. diameter, accompanied by a severe conjunctivi-

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tis and soon followed by an iritis. Therapy was then withheld for one-half hour, no attempt being made to irrigate out or neutralize the chemical. This was done in order further to simulate our clinical cases.

Control group

Following such an injury, in the absence of any therapy, we noticed an immediate necrosis in the contact area. Soon conjunctival injection, with exudation, followed; then intense ciliary injection as the remainder of the cornea became cloudy. This changed little, except for a gradual progression of the vascular reaction, so that on about the fifth day, a very short brush of straight vessels appeared like a fringe at the limbus. This brush then proceeded to elongate and generally reached the lesion by the seventh day.

On about the 10th day, the brush of vessels began to be replaced by heavier, branching vessels which did not arise from the limbus, but from about one or two mm. beyond it. The branching vessels then invaded the central necrotic area, which became well vascularized by about the 14th day. By the 16th day, the vessels started to become narrower, and less numerous.

By approximately the 21st day, the center of the lesion had a muddy or salmon-patch appearance due to the tiny arborizations in that area. After this, no appreciable change occurred in central scarred area, in the peripheral clear areas, or in the conjunctiva, except for an apparent tightening of the scar tissue, as evidenced by progression of descemetocele or symblepharon.

Since no great change occurred after the third week despite a 60-day observation period, the treated animals were observed for only 30 days.

Hydrosulphosol group

In this group, 12 eyes were treated with a five-percent solution of Hydrosulphosol in castor oil. Allowing one-half hour after injury, the drug was instilled in excess into the cul-de-sacs. The rabbits' cul-de-sacs hold a great deal more medication than those of a human.

The medication was instilled four times daily, for the first three days, and then three times daily.

On about the fourth or fifth day, these rabbits developed a bacterial conjunctivitis. The organism was found to be a short, thin, gram-negative rod, which on study was presumptively classified as Noguchia cuniculi, a nonpathogenic organism endemic in rabbits. The infection was cleared in two days by the use of terramycin eye ointment.

About the fifth day, the characteristic brushlike advancement of vessels began. By the ninth day, an unexpected condition was observed. This was a depilatory action, apparently due to the Hydrosulphosol, as it did not occur in the other rabbits. The white fur on the rabbits eyelids readily fell out so that within a few days most of them had large, pink, naked areas on their eyelids. This is of interest when one considers the biochemical rationale for the use of Hydrosulphosol.

By the 10th day, several of the rabbits had some degree of descemetocele. By the 15th day, symblepharon was marked in half the rabbits. By the 20th day, symblepharon and entropion were well advanced. By the 21st day, the brush type of vascularity had been replaced in all the rabbits by the branching type.

At the end of one month, all animals had hopelessly scarred corneas, just as bad as those in the control group, and half had well-developed symblepharon.

Cortisone ointment group

These rabbits suffered the same injury and were treated with a special 2.5-percent ophthalmic ointment preparation of cortisone acetate. They, too, were treated four times daily for the first three days; then three times daily for one month.

On the first day of treatment, these rabbits seemed to show a more severe reaction, with more corneal edema and conjunctival

injection than those treated with Hydrosulphosol. However, by the end of the second day, the reaction appeared approximately equal in both groups.

The secondary bacterial conjunctivitis began a day earlier in most of the cortisone-treated rabbits than it did in the Hydrosulphosol-treated group.

The brushlike injection appeared on about the fifth day but, in this group, it never became really marked. In fact it appeared to recede before passing on to the next stage.

The fine branching began to appear on about the 15th day, as compared to the 12th day for the Hydrosulphosol-treated group. A complete transition from the brushlike form to the branchlike form was not noted until about the 22nd day.

During the ensuing two weeks, however, the vascular branches were seen to grow in, until eventually the scar became as well vascularized as the Hydrosulphosol-treated and the control group. It merely took about two weeks longer for the same degree of vascularization to occur. Scarring was as complete as in the other groups, and again about half the eyes developed symblepharon.

Glutathione group

Because of the possibility that we were getting inadequate absorption from the topical administration of Hydrosulphosol we tried to feed the drug. However, the animals refused to eat the drug prepared as a concentrated syrup, or when mixed well with their food or drink. An attempt to inject it produced too much reaction.

Since the rationale of Hydrosulphosol therapy is based on presentation of an excess of sulfhydryl groups for local metabolism, we decided to inject reduced glutathione in pure form into the area. Glutathione, in its reduced form, is known to have a free and readily oxidizable sulfydryl group.

Solutions of 2, 5, 10, and 20 percent were prepared and injected subconjunctivally. The strongest solution tolerated without too much reaction was the 10-percent preparation. Consequently, each of 10 rabbit eyes was treated with one-cc. injections subconjunctivally of pure reduced glutathione, given twice weekly.

Again infection with the same organism developed about the fifth day, and promptly subsided when treated with terramycin. No change in the initial type of reaction was noted.

Brushlike vessels began to appear about the eighth day. By the 12th day, the brushes were from two to four mm. in length. By the 18th day, the brush forms were practically all replaced by the branching forms.

By the end of the month, the eyes had suffered as much scarring as any of those in the previously described groups; again half the eyes had symblepharon. The lens of one rabbit in this group extruded through a descemetocele while being medicated.

Subconjunctival cortisone group

Since absorption from the 2.5-percent cortisone ointment might not be adequate, we decided to give another series of rabbits subconjunctival injections of cortisone-acetate suspension. Following the same type of burn, 10 eyes were selected for injection of 25 mg. of cortisone twice weekly. These rabbits also developed a secondary infection on about the fourth day, which was controlled with terramycin.

The brushlike vessels began to appear about the ninth day. By the 12th day they were only about one to one and one-half mm. long, as compared to the two- to four-mm. vessels found in the glutathione-treated group. By the 16th day, the branching process had begun and was well developed by the 20th day.

The vessels were fewer in number and smaller in caliber than those in the glutathione-treated group. The cortisone-treated animals seemed to have slightly less necrosis and reaction than the other groups. However, by the end of the month the vascularization was practically the same and one third of them had symblepharon.

Comment

Following a severe alkali burn to the eye, two main pathologic processes contribute to loss of vision:

One is direct—the corneal edema, infiltration, necrosis, ulceration, scarring, and vascularization, with the possibility of perforation during the acute phase.

The other is indirect—the conjunctival irritation, with resultant symblepharon, entropion, or ectropion.

In mild burns, however, which are more common than severe ones, these serious sequelae are very rare. Therefore, it is rather difficult to evaluate therapeutic agents on a clinical basis, where the consistency of the burns cannot be controlled. Accordingly, we tried to compare the efficacy of certain drugs against Time and Nature herself, in the prevention of these sequelae in controlled experiments.

It was seen that Hydrosulphosol topical therapy did not produce end results significantly different from those in the untreated control series. Theoretically, it has been assumed that the placing of a medication supposedly so rich in sulfhydryl groups on injured tissue should aid in the healing of epithelial structures. The validity of this can be questioned since the histochemical studies of Wislocki[4] showed that sulfhydryls were present in appreciable amount only in the corneal epithelium, yet it is healing of the stroma we are trying to promote.

It is also interesting to note that this substance which is supposed to be good for the epithelium actually produced depilation in most of our rabbits. In regard to this phenomenon, Flesch and Goldstone[5] have commented:

"The localized temporary cessation of hair growth suggested interference with the normal process of keratinization, which involves the oxidation of -SH groups to -S-S-bridges. The intermediary polymers inactivated in vitro the free -SH groups of glutathione. . . . Inhibition of a sulfhydryl enzyme, succinic dehydrogenase, occurred with the same concentrations as the inactivation of -SH groups."

From this we might suspect that the inefficacy of the Hydrosulphosol in these experiments may be due to failure of liberation of free -SH groups, perhaps because of innate qualities of the preparation, and perhaps because of changes brought about in the medication by its application. However, the complete answer to the treatment of alkali burns would not appear to lie merely in the local deposition of free sulfhydryl groups.

Certainly glutathione in its reduced form is conceded to be a good source of free sulfhydryl. This was injected into or about the injured tissue in rabbits who had an ample level of vitamin C in the blood. The latter had been checked because ascorbic acid is believed to be important to oxidation-reduction reactions which occur in this healing process. The injected glutathione was found to be no more effective than the Hydrosulphosol.

Cortisone was used because of its known effects in suppressing reactive necrotic changes, inflammatory response, neovascularization, and excessive scar-tissure formation. In these severe burns, the only effect it had was to delay the advancement of the neovascularization; indeed it was suspected that it may have weakened the defense against secondary infection. The end result was just the same as in the untreated controls.

Conclusions

The topical application of Hydrosulphosol to rabbit eyes which had been severely burned with sodium hydroxide produced no better end results in a one-month period than might be expected with no treatment at all. The topical application of cortisone ointment, the subconjunctival injection of cortisone suspension, or the subconjunctival injection of 10-percent solution of reduced glutathione also produced no better result than might be expected from no treatment at all.

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PERIODIC OPHTHALMIA IN HORSES*

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Heusser[1] was the first who, in 1948, found leptospiral agglutinins in the serum and the aqueous humor of a great number of horses suffering from periodic ophthalmia. These results have been confirmed by Rimpau,[2] and later by Kathe,[3] Yager,[4] Rossi,[5] and Bohl and Ferguson.[6] Kathe, as well as Hartwick and Stocke,[7] succeeded in culturing Leptospira from samples of aqueous humor and very recently Heusser[1] was able to produce experimentally typical uveitis in two foals. Therefore, today there is little doubt as to the etiology of this disease.

More and more frequently human leptospiral uveitis is being reported (Gsell, Rehsteiner, and Verrey,[8] Doret and Röhm,[9] Gilbert,[10] Otto,[11] Pagani,[12] Alexander[13]). Alexander has even produced leptospirae from human aqueous humor.

There is one particularly interesting fact in periodic ophthalmia of horses: during an acute stage, especially in later relapses of the disease, the agglutination-titer in the aqueous humor is often much higher than in the serum. Gsell, Rehsteiner, and Verrey,[8] in 1946, suggested such a titer difference in a human case of leptospiral uveitis in a patient suffering from swineherd disease, and Heusser and Gsell[14] were the first to report it in equine leptospirosis. The French veterinarian, Rossi[5] also found higher aqueous-humor titers in three cases.

At least two possibilities may be suggested for these relatively high agglutination titers in the aqueous humor: (1) It is conceivable that the antibodies are transported from the blood by an increased permeability due to the inflammation; (2) it is also possible that the antibodies are formed locally in the infected tissue.

The resolution of this problem may be of some importance since the information may yield clues to the diagnosis of uveitis. Furthermore a study of equine leptospiral uveitis should reveal findings which would be useful in other infectious eye diseases not only in horses but also in human beings.

Present study

These experiments are based on the following questions:

1. In which blood-protein fraction are the leptospiral agglutinins to be found?

2. Can significant changes of the different protein fractions in blood and aqueous humor be proved?

3. What relation exists between the agglutinin-containing protein fraction in blood and aqueous humor on the one hand and the level of the titer on the other?

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We wish to express our gratitude to Dr. E. Wiesmann from the Bacteriologic Institute, St. Gallen, who did the agglutination-lysis-reaction against Leptospires in all cases reported in this paper.

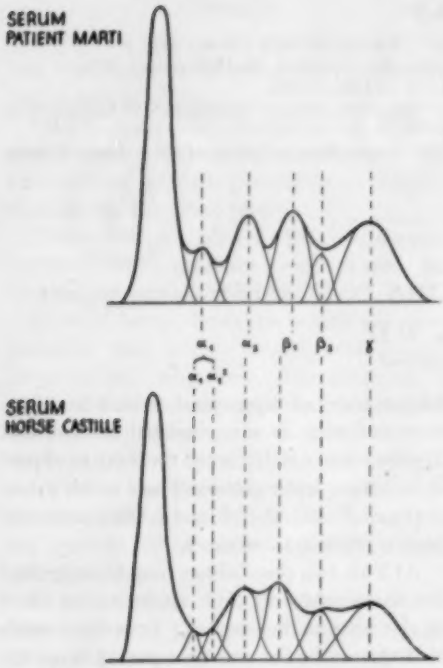

Fig. 1 (Witmer). Electrophoretic diagram.

4. Does the agglutination titer in the aqueous humor depend on the number and nature of cells?

5. How do the agglutination titers in blood and aqueous humor behave when a second infection is artificially produced with Erysipelothrix erysipelatus suis in a horse suffering from leptospirosis?

1. *In which blood-protein fraction are the leptospiral agglutinins to be found?*

Two serums with high antibody content were fractionated electrophoretically according to a technique described elsewhere (Witmer[15]). One serum was from the experimentally infected (with Leptospira pomona) foal of Heusser, the other from a naturally infected horse with a high titer against L. grippotyphosa. The results are shown in Table 1.

As far as the electrophoresis of horse serum is concerned we can say that by means of the procedure with filter paper (Grassmann and Hannig[16]) we are able to produce more fractions than Wunderly[17] and Edsall[18] with the Tiselius apparatus. We call these fractions albumin, α_1, α_1^I, α_2, β_1, β_2, and γ. The differentiation between α_1 and α_1^I does not always succeed entirely, but α_2 is found regularly and shows the same mobility as α_2 in human serum. β_1 corresponds with the human β. The β_2 fraction cannot always be completely separated from the γ-fraction. It is quite possible that this β_2-fraction belongs to the γ-globulin-group. The very complex nature of the γ-fraction has already been stressed by Wuhrmann and Wunderly,[19] Tiselius,[20] Roubert,[21] and Jager,[22] who showed that different components might be hidden mainly in the broad curves of the electrophoretic diagram (figs. 1 and 2).

The formerly described method of the quantitative separation for serologic use does not always make it possible to separate the different fractions in an absolutely proper way. In the resulting fractions some particles of the neighbor fraction can be found. It is especially difficult to separate the β_2- from the γ-globulins. Table 1 shows that the

TABLE 1

LEPTOSPIRAL AGGLUTININS

	Agglutination I						
	Albumin	α_1	α_1^I	α_2	β_1	β_2	γ
Foal (No. 6 (Heusser) experimentally infected with L. pomona. Titer 1:4,000	Neg.	Neg.	Neg.	Neg.	+1:2	+1:16	+1:16
Horse Bambola, naturally infected with L. grippotyphosa. Titer 1:2,000	Neg.	Neg.	Neg.	Neg.	Neg.	+1:2	+1:16

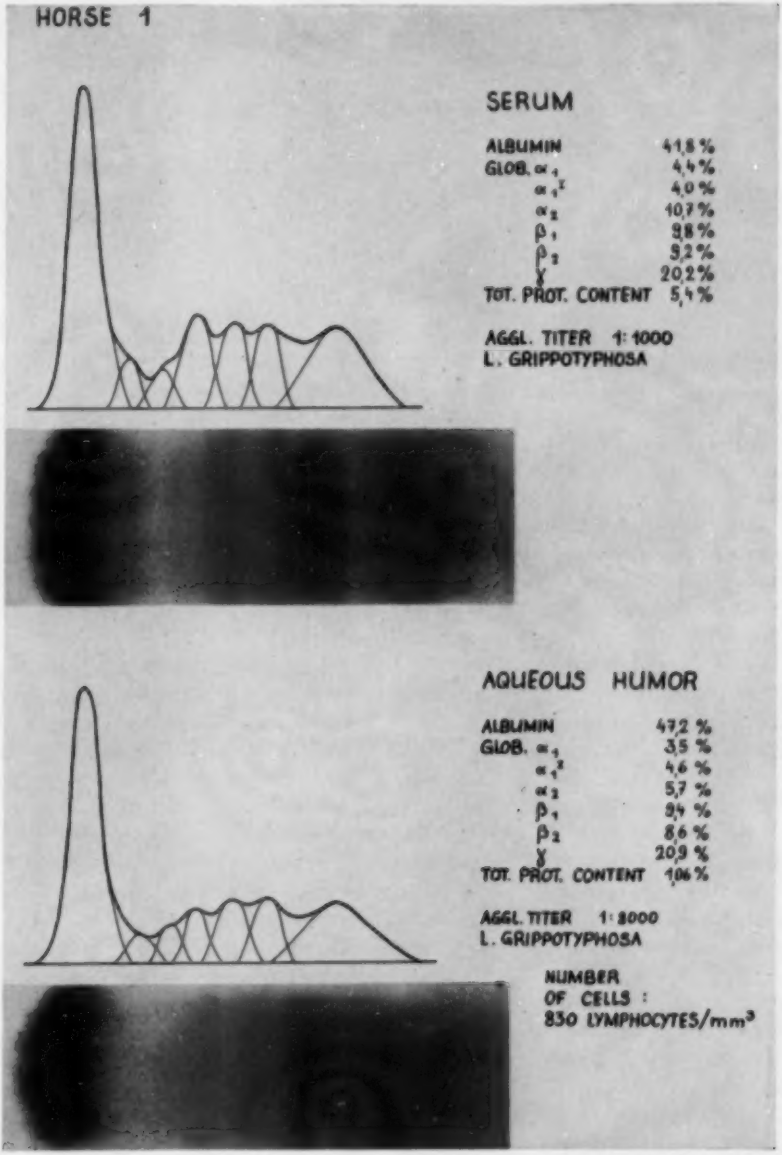

Fig. 2 (Witmer). Electrophoretic diagram.

TABLE 2

ARTIFICIALLY PRODUCED ERYSIPELOTHRIX AGGLUTININS

	Agglutination									
	1:10	20	40	80	160	320	640	1280	2560	5120
Serum of a highly immune horse*	−	−	−	+	++	+++	+++	+++	+	−
Serum of a normal horse	−	−	−	−	−	−	−	−	−	−
Protein fractions of a highly immune horse†										
Albumin	−	−	−	−	−	−	−	−	−	−
$\alpha_1+\alpha_2$	−	−	−	−	−	−	−	−	−	−
β	(+)	−	−	−	−	−	−	−	−	−
γ	+++	+++	+++	++	−	−	−	−	−	−

* In case of an antibody surplus in highly immune horses we find an inhibition of agglutination in low dilutions. The agglutination reaches a maximal stage in a dilution in which antigen and antibody are more or less balanced.

† After quantitative electrophoretic separation the resulting fractions are highly diluted so that no inhibition can take place.

leptospiral agglutinins belong to the γ-globulin-group.

The same method gave us the opportunity to prove that the artificially produced agglutinins against erysipeloid are γ-globulins. The results are shown in Table 2.

Previously we proved that the human antibodies responsible for the hemagglutination test for tuberculosis (Middlebrook and Dubos[23]) are also γ-globulins.

Having found a significant increase of the α-fraction in chronically infected aqueous humor Wunderly and Cagianut[24] believe that part of the antibodies could possibly be α-globulins. In two acute cases of polynuclear iritis they have found a considerable γ-globulin increase. Yet in none of the two fractions could they prove the presence of any specific antibodies.

We may mention here that the globulins and antibodies are supposed to be formed in the plasma cells, presumably also in the lymphocytes, but especially in the reticuloendothelial system. Moeschlin[25] recently succeeded in showing the presence of typhoid antibodies in plasma cells of the spleen in experimentally infected rabbits. Therefore, the statement of Wunderly and Cagianut that there was an increase in γ-globulins in two cases of polynuclear iritis and an increase in α-globulins in chronic lymphocytic uveitis is still no proof of an increase in antibodies.

The following experiments confirm our opinion that the fluctuations in protein fractions in the electrophoretic diagram of aqueous humor are not at all correlated to antibody titers.

On the other hand, it has been known for a long time that in chronic infectious diseases the serum shows a relative increase of the α- and γ-globulins and a diminution of the albumins. However, if the total protein content is diminished, it will only be a proportional and not a real α- and γ-increase.

2. *Can we prove significant changes of the different protein fractions in blood and aqueous humor?*

By means of our earlier experiments with paper electrophoresis we could prove that the infected human aqueous humor contains the same protein fractions as the serum. In a great number of cases we found statistical evidence of a fairly good correspondence between aqueous humor and serum protein fractions. No significant changes could be found either in acute polynuclear or in chronic lymphocytic cases, except in the albumin fraction.

With horses suffering from periodic ophthalmia the same protein fractions can be found in the aqueous humor as in the serum.

TABLE 3

ELECTROPHORETIC SERUM AND AQUEOUS VALUES EXPRESSED AS PERCENT OF TOTAL PROTEIN

Name	Material	Albumin	α_1	α_2	β_1	β_2	γ
1. Baduar	Serum	41.8	8.4	10.7	9.8	9.2	20.2
	Aqueous	47.3	8.1	5.7	9.4	8.6	20.9
2. Bambola	Serum	40.2	4.1	13.8	11.5	8.4	21.5
	Aqueous	40.8	8.0	6.5	8.6	10.8	25.3
3. Lusingo	Serum	37.3	8.9	13.0	10.0	10.1	20.7
	Aqueous	31.9	7.0	10.0	21.3	19.2	10.6
4. Desna	Serum	35.0	5.9	17.2	15.9	7.5	18.5
	Aqueous	45.1	4.2	10.0	9.2	8.1	23.4
5. Orb	Serum	40.8	6.5	10.8	16.3	5.4	20.2
	Aqueous	56.6	6.8	4.9	12.9	3.7	15.0
6. Marchesa	Serum	39.5	4.9	17.1	13.0	6.1	19.4
	Aqueous	51.0	3.1	10.1	9.7	9.5	16.6
7. Lerna	Serum	35.9	3.9	13.0	25.8	9.3	12.1
	Aqueous	46.1	4.9	11.4	16.2	10.0	11.2
Average	Serum	38.6	6.0	13.6	14.7	8.0	18.9
	Aqueous	45.5*	6.0	8.3†	12.4	10.0	17.5
Normal Horse Serum		38.3	7.5	12.2	12.2	9.2	19.8

* Difference significant only with 95 percent.
† Difference significant with 99,9 percent.

Here, too, there are only small average percentage changes of the different fractions: a scarcely significant increase of the albumins, which on account of their small molecular weight can pass easily through the blood-aqueous barrier. On the other hand, the value of the α_2-globulins is significantly lower. Yet there is no increase of the γ-globulins, although that could have been expected in our cases with their very high titers.

In single cases of equine leptospirosis we sometimes find a striking relative increase of the α_2- and β_1-globulins, although it is not a general rule. The average serum value is not found significantly different from the normal average value (Table 3).

We can answer the second question as follows: in the aqueous humor of horses suffering from periodic ophthalmia, we can always prove the presence of the agglutinin-containing γ-fraction but, compared with the blood, no significant change can be stated.

3. *What relation exists between the agglutinin-containing protein fraction in blood and aqueous humor on the one hand and the level of the titer on the other?*

Comparing the relative percentage of the γ-globulins in serum and aqueous humor we can find in three of eight cases a slight increase of γ-globulins in the aqueous humor, in three cases a distinct reduction, and in two cases no change. As already mentioned, the average values of seven cases show no significant change in the γ-fraction. These small changes obviously cannot be compared with the often much higher agglutination titers. This becomes even clearer if we consider the absolute amount of γ-globulins which in the serum is four to 70 times higher than in the aqueous humor. In special cases, however, the agglutination in the aqueous humor may be found positive in 10-times higher dilutions (Table 4).

These results indicate that electrophoretic studies do not necessarily reflect fluctuations in the concentrations of antibodies. In spite of their high degree of serologic activity, the absolute amount of antibodies must be rather

TABLE 4

PROTEIN FRACTION AND AGGLUTINATION TITER IN BLOOD AND AQUEOUS

Name and Number	Material	Protein Content gm. %	γ-Globulin gm. %	Agglutination Titer	Number and Nature of Cells
1. Baduar 177+51	Serum Aqueous	5.4 1.06	1.09 0.221	1:1,000* 1:8,000	830 Lymphocytes and leukocytes
2. Bambola 175+51	Serum Aqueous	6.8 0.28	1.46 0.071	1:2,000* 1:16,000	100 Lymphocytes
3. Desna 397+52	Serum Aqueous	5.1 0.52	1.24 0.122	1:8,000* 1:3,200	300 Lymphocytes
4. Lusingo 937+50	Serum Aqueous	5.9 0.16	1.24 0.017	1:1,600* 1:1,600	160 Lymphocytes
5. Amaya 80+52	Serum Aqueous	7.1 0.05	1.67	1:400* Neg.	4/3 Lymphocytes
6. Marchesa 833+51	Serum Aqueous	4.5 1.5	0.87 0.24	1:200* 1:20,000*	570 Leukocytes and lymphocytes
7. Lerna 714+52	Serum Aqueous	5.24 1.27	0.23 0.087	1:400* 1:2	2/3 Lymphocytes
8. Orb	Serum Aqueous (r) Aqueous (l)	5.71 0.086 1.2	1.14 0.022 0.18	1:16,000† 1:8,000 1:64,000	2/3 Lymphocytes 130 Lymphocytes

* Leptospira grippotyphosa.
† Leptospira pomona.

small. To a certain extent, however, the relation of the different amounts of γ-globulins in the serum and aqueous humor can be considered to be approximately the value of antibodies passing from the blood into the anterior chamber.

4. *Does the agglutination titer in the aqueous humor depend on the number and nature of cells?*

In most cases of equine leptospirosis, we usually found a large number of lymphocytes, which means a more chronic irritation; in only two cases were there polynuclear leukocytes together with many lymphocytes. The highest number of cells was 830 per $mm.^3$, in most cases 100 to 300 per $mm.^3$ and in three cases only 2 to 4 per $mm.^3$.

The total protein content and with it the absolute amount of γ-globulins usually goes parallel with the number of cells. One is almost tempted to say that the protein content depends on the number of cells. Yet such a conclusion should not be made since both the number of cells and the protein content are the result of the degree of irritation as well as of the more or less pronounced disturbance of the permeability of the blood-aqueous barrier.

No correlation is found between the agglutination titers and the number or type of cells in the aqueous humor. For example the aqueous humor with the highest titer of 1:64,000 contains only 130 lymphocytes (Case 8), while in Case 1 a titer of 1:8,000 with infinitely more cells is found. The most we can say is that a low titer is always found with a low number of cells. That means that in a nonirritated eye no antibodies can be proved, a fact which has been known for a long time.

5. *How do the agglutination titers in blood and aqueous humor behave in case of an artificially produced secondary infection with erysipeloid in a horse suffering from leptospirosis?*

Our cases show clearly that there must be a local antibody formation in the eye or that

TABLE 5A

COMPARISON AGGLUTINATION TITERS IN BLOOD AND FIRST AQUEOUS FOR ERYSIPELOTHRIX AND LEPTOSPIROSIS

Date	Material	Protein Content gm. %	γ-Globulin gm. %	Agglutination Titer Erysipeloid	Agglutination Titer L. Pomona	
					Calculated	Real
4/12	Serum	6.05	1.27	1:160		1:16,000
	Aqueous (r)	0.05	0.0075	Neg.	—	1:500
	Aqueous (l)	0.103	0.021	1:8	1:800	1:4,000
11/12	Serum	6.9	1.79	1:320		1:8,000
	Aqueous (r)	0.14	0.031	1:20	1:500	1:4,000
	Aqueous (l)	0.74	0.15	1:10	1:250	1:8,000
26/12	Serum	6.5	1.78	1:512		1:16,000
	Aqueous (r)	0.11	0.027	1:32	1:1,000	1:2,000
	Aqueous (l)	0.24	0.045	1:64	1:2,000	1:16,000

the inflamed tissue absorbs antibodies from the blood. Yet the absorption of the antibodies, as well as the local formation, could be unspecific. This is not the case, because we can prove the contrary by producing in a horse suffering from leptospirosis a secondary infection.

What can be said for one antibody must also be true for another antibody.

In horse 6, suffering from severe leptospirosis with uveitis in both eyes (the right eye showed, at the beginning of the experiment, a severe hypopyon iritis, and the left showed signs of old iritis with beginning atrophy), we produced experimentally an infection by Erysipelothrix erysipelatus suis. This strain does not cause any signs of disease in horses and is only pathogenic for swine, causing swine erysipeloid. The subcutaneous inoculations were done once weekly with gradually increasing doses of 20 to 50 ml. of virulent living broth cultures.

This immunization was done in exactly the same way as in horses chosen for production of erysipeloid antiserum.* The formerly negative titer increased slowly and, after two months, reached a height of 1:512. In the meantime the uveitis had passed from an acute into a chronic stage. The irritation slowly decreased and the originally very high titer was distinctly lower.

Comparing the respective titers in blood and aqueous humor against Leptospira pomona on the one hand and against erysipelothrix on the other, we can say:

Table 5A. The serum agglutination titers for erysipelothrix were usually lower than those for leptospirae. With the erysipelothrix bacilli, only a general infection was produced, certainly not a local one. We may therefore say that the erysipelothrix agglutinins in the aqueous humor represent not only a general measure of the total number of antibodies passing from the blood into the eye but also a measure of the leptospiral antibodies. If all antibodies in the anterior chamber came out of the blood, the relation between the two antibodies in the aqueous humor should be equivalent to those in the serum. Yet this is not the case. In the first aqueous humor of both eyes, right and left, the leptospiral agglutination titer is always found to be much higher in relation to the titer of erysipelothrix antibodies than one would expect.

In Table 6A an attempt is made to compare the absolute amount of γ-globulins in serum and aqueous humor with the two agglutination titers. Calculating the height of the titer, regarding the total amount of γ-globulins in the serum and aqueous humor, we can see that the values for the erysipelothrix agglutinins correspond fairly well. All except one are a little too high, yet there are only small differences (never more than

* Swiss serum, Vaccine Institute, Berne.

TABLE 5B

COMPARISON AGGLUTINATION TITERS IN BLOOD AND SECOND AQUEOUS* FOR ERYSIPELOTHRIX AND LEPTOSPIROSIS

Date	Material	Protein Content gm. %	γ-Globulin gm. %	Agglutination Titer Erysipeloid	Agglutination Titer L. pomona	
					Calculated	Real
4/12	Serum	6.05	1.27	1:160		1:16,000
	Aqueous (r)	0.96	0.134	1:64	1:6,400	1:2,000
	Aqueous (l)	0.60	0.087	1:16	1:1,600	1:8,000
11/12	Serum	6.9	1.79	1:320		1:8,000
	Aqueous (r)	1.03	0.23	1:64	1:1,600	1:2,000
	Aqueous (l)	0.805	0.17	1:20	1:500	1:16,000
26/12	Serum	6.5	1.78	1:512		1:16,000
	Aqueous (r)	1.66	0.33	1:128	1:8,000	1:1,000
	Aqueous (l)	0.48	0.099	1:64	1:2,000	1:32,000

* Second aqueous humor was collected 10 minutes after the first puncture.

five times higher). Quite different values are found for the leptospiral agglutinins. In the first aqueous humor all, without exception, are much higher than expected. The differences vary from 5 to 40 times higher titers. It must be mentioned, however, that this method of calculation can only be a very approximate one, a fact which has already been mentioned under point 3.

Tables 5B and 6B show that the conditions in the second aqueous humor, collected 10 minutes after the first puncture, are quite different. The second aqueous usually contains more proteins than the first aqueous humor, yet the increase is apparently less distinct in more severely irritated eyes where the first aqueous humor is already quite rich in proteins.

We notice that in the second aqueous humor (table 5B) of the right eye the effective titer corresponds more or less to the calculated values. It may even be lower. In the left eye, however, the real agglutination titer remains very high. The same results may be seen in Table 6B. The sudden hypotension following the first puncture leads to a pathologic disturbance of the permeability of the blood-aqueous barrier. All serum protein fractions, including the immune globulins with their high molecular weight, are now passing easily from the blood into the eye. We therefore find a rising agglutination titer for the erysipelothrix antibodies, while the locally formed leptospiral antibodies, which have been taken away by the first puncture, show a decrease. Their titer now corresponds to the absolute protein content. The left eye, however, since it is more

TABLE 6A

COMPARISON γ-GLOBULINS IN BLOOD AND FIRST AQUEOUS WITH AGGLUTINATION TITERS

Date	Material	γ-Glob. Serum / γ-Glob. Aqueous	Agglutination Titer Erysipeloid		Agglutination Titer Leptospira pomona	
			Calculated*	Real	Calculated	Real
4/12	Aqueous (r)	170/1	1:1	Neg.	1:95	1:500
	Aqueous (l)	60/1	1:8	1:8	1:266	1:4,000
11/12	Aqueous (r)	57/1	1:5	1:20	1:140	1:4,000
	Aqueous (l)	11.9/1	1:27	1:10	1:670	1:8,000
26/12	Aqueous (r)	66/1	1:8	1:32	1:242	1:2,000
	Aqueous (l)	40/1	1:13	1:64	1:400	1:16,000

* See footnote Table 6B.

TABLE 6B

COMPARISON γ-GLOBULINS IN BLOOD AND SECOND AQUEOUS WITH AGGLUTINATION TITERS

Date	Material	γ-Glob. Serum / γ-Glob. Aqueous	Agglutination Titer Erysipeloid		Agglutination Titer Leptospira pomona	
			Calculated*	Real	Calculated	Real
4/12	Aqueous (r)	9.5/1	1:16	1:64	1:1,690	1:2,000
	Aqueous (l)	14.6/1	1:10	1:16	1:1,090	1:8,000
11/12	Aqueous (r)	7.75/1	1:40	1:40	1:1,000	1:2,000
	Aqueous (l)	10.5/1	1:32	1:20	1:800	1:16,000
26/12	Aqueous (r)	5.4/1	1:100	1:128	1:2,960	1:1,000
	Aqueous (l)	18/1	1:28	1:64	1:890	1:32,000

* Calculated values: Height of titer (against Leptospira pomona) calculated knowing the height of titer in the serum, the absolute γ-globulin-content of the serum and of the aqueous humor.

affected and already showing signs of a beginning atrophy, no longer functions properly.

Summing up the results of Tables 5A, 5B, 6A, and 6B, we can say that the agglutination titer against Leptospira pomona in the first aqueous humor—under more or less physiologic conditions—is always and distinctly higher than the titer against erysipelothrix. These differences may disappear in the second aqueous humor. In the first aqueous humor of horses suffering from leptospirosis with uveitis, there is a surplus of specific antibodies which can only be explained by a local formation in the reticuloendothelial system of the iris and uvea. A specific absorption and secretion of antibodies into the aqueous humor is not probable.

DISCUSSION

What conclusions can be drawn from these results?

We have proved that the antibodies responsible for the agglutination-lysis reaction in leptospirosis and the experimentally produced antibody against erysipelothrix in horses are both present in the γ-globulin fraction.

We have shown that the method of paper electrophoresis seems to be unable to show quantitatively the naturally and experimentally produced antibodies. The γ-globulin fraction must be very inhomogeneous. The biologic (serologic) methods still are much more sensitive.

No conclusions regarding possible antibodies in other than the γ-fractions should, however, be drawn from the electrophoretically measured changes of the protein fractions in the aqueous humor.

Our data failed to show any relation between the numbers or types of cells in the aqueous humor and the antibody concentrations. It is of some interest, however, that microscopically the tissues of some of the infected eyes revealed accumulations of lymphoid cells in the iris and ciliary body.

We can prove that the leptospiral infection in the eye of horses leads to a high antibody content in the aqueous humor. The production most probably takes place in the inflamed uveal tissue.

In the first aqueous humor of a double-immunized horse, the amount of natural leptospiral antibodies will always be much higher than that of the experimentally produced erysipelothrix antibodies. We can conclude that an excessive antibody titer, referring to the γ-globulin content in the infected equine aqueous humor, is the result of a local leptospirosis.

SUMMARY

Our findings support the suggestion that periodic ophthalmia in horses is largely a local leptospiral infection. The local and selective

antibody formation in the inflamed eye can reach very high agglutination titers. The antibody content does not depend on the number and nature of cells circulating in the aqueous humor. The antibodies against leptospirae and against erysipelothrix are γ-globulins. Paper electrophoresis cannot give a quantitative measure of the antibody content in the aqueous humor.

Appendix

(Report of cases in Table 4.)

Case 1

Baduar 177 + 51, a six-year-old German gelding. During acclimatization, streptococcal angina.

1. Eye disease in May: Iridocyclitis left eye.
2. Eye disease in July: Iridocyclitis left eye.
3. Eye disease in September: Iridocyclitis left eye, total cataract.

Agglutination: Leptospira grippotyphosa; serum 1:1,000; aqueous humor, 1:8,000.

Case 2

Bambola 176 + 51, a five-year-old German mare. During acclimatization, abscess (cheek).

Eye disease unknown. First seen with total blindness of the left eye, total cataract and slight irritation.

Agglutination: Leptospira grippotyphosa; serum, 1:2,000; aqueous humor, 1:16,000.

Case 3

Desna 397 + 52, a four-year-old German mare. During acclimatization, streptococcal angina.

1. Eye disease in August: Iridocyclitis left eye, disappeared under treatment with atropine and compresses.

Agglutination: Leptospira grippotyphosa; serum, 1:800; aqueous humor, 1:3,200.

2. Eye disease in December: Diffuse keratitis, left eye, with slight uveal irritation. Quick improvement under local cortisone treatment.

Case 4

Lusingo 937 + 50, a six-year-old German gelding. During acclimatization, streptococcal angina.

1. Eye disease: Left eye during acclimatization May, 1952.
2. Eye disease: Left eye, August, with uveal irritation.

Agglutination: Leptospira grippotyphosa; serum, 1:1,600; aqueous humor, 1:1,600.

Case 5

Amaya 80 + 52, a five-year-old German mare. During acclimatization, streptococcal angina.

1. Eye disease in May, 1952: Iridocyclitis, left eye.
2. Eye disease in September: Iridocyclitis, left eye, with very slight irritation.

Agglutination: Leptospira grippotyphosa; serum, 1:400; aqueous humor, negative.

3. Eye disease in November, 1952: Diffuse keratitis, treated and healed in short time with local cortisone. Only a slight lens opacity remained.

Case 6

Marchesa 833 + 51, a five-year-old German mare. During acclimatization, streptococcal infection.

1. Eye disease in December, 1951: Iridocyclitis, right eye.
2. Eye disease in February, 1952: Iridocyclitis, right eye.
3. Eye disease in November, 1952: Iridocyclitis, right eye, total cataract, slight haziness of cornea, and beginning vascularization.

Agglutination: Leptospira grippotyphosa; serum, 1:200; aqueous humor, 1:20,000.

Case 7

Lerna 714 + 52, a four-year-old German mare.

1. Eye disease during journey from Germany to Switzerland with slight peripheral haziness of cornea and serofibrinous iritis. Opacities of the posterior pole of the lens.

Agglutination: Leptospira grippotyphosa; serum, 1:400; aqueous humor, 1:2.

Treatment with aureomycin injections into the anterior chamber and subconjunctivally. Very quick improvement. Only slight lens opacities remained.

Case 8

Orb, a nine-year-old Swiss mare.

1. Eye disease: Right eye during 1951, became blind from cataract.
2. Eye disease: Left eye September, 1952, severe iritis, progressing cataract. Blind in a short time.

Agglutination: Leptospira pomona; serum, 1:16,000; aqueous humor (right eye), 1:8,000; aqueous humor (left eye), 1:64,000.

There are several striking facts:

All horses imported from Germany are suffering from Leptospira grippotyphosa. The only affected Swiss horse is suffering from Leptospira pomona. Practically all horses had streptococcal infections during the acclimatization period. But this seems to be a general rule for all imported horses.

Fresh cases show low titers; old cases, after several relapses, show very high agglutination titers.

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Ophthalmic Miniature

And that condition of the sight which is
In eyes but lately smitten by the sun
Bereft me of my vision some short while.
Dante's *Divine Comedy.*

CLINICAL PATHOLOGIC CONFERENCE

From the Laboratory of

PARKER HEATH, M.D.
Boston, Massachusetts

CASE 2 (E-51-52)

History. A boy, aged three years, walked into the clinic and did not appear to be in pain. The mother gave a history of noticing a peculiar reflex in the left eye 18 months before. She has not consulted a doctor before. The child was a full-term baby.

Examination of right eye. The globe was normal in appearance. There was pupillary response to light and normal anterior chamber and media. Examination with the ophthalmoscope through a dilated pupil showed no evidence of inflammation or any visible evidences of a pathologic condition.

Examination of left eye. The eye of normal size showed a partly dilated pupil which did not react to light, and there was no consensual light reflex, as could be seen in the right eye. However, a slight consensual response was seen in the left eye after stimulation of the right by light. The iris was slightly paler blue in the left than in the right eye. Intraocular pressure was estimated to be normal in each eye.

Examination of the fundus of the left eye with an ophthalmoscope showed a large light-colored mass lying over the entire lower half of the retina with two rounded lobes extending up and out. Retinal vessels spread over this mass.

In the uppor portion of the fundus, the retina appeared milky white, and the vessels were widely dilated. The nervehead could be seen. The disc was blurred and above the nervehead was noted a region of retinal degeneration.

Media were clear. Transillumination of the eye showed decreased transmission of light.

X-ray report. No evidence of increased intracranial pressure was seen on X-ray examination. Bony structures of the skull appear to be within normal limits. The sella turcica was well formed and no erosion of the clinoid processes was seen. Calcium deposits were not noted in the regions of the eyes.

General physical examination. Normal findings.

Treatment. Enucleation of the left eye was advised and accepted.

DIFFERENTIAL DIAGNOSIS

Discussion by Dr. A. Pollen.* The problem is the differential diagnosis of a retrolenfal mass in a young child. The history of a full-term baby and the data advising us of the unilaterality of the process are important. These practically exclude from consideration the retinopathy of prematurity. The remaining possibilities fall into four or five groups, each of rare occurrence.

Group I. Retinal aplasia or dysplasia. This is usually unilateral and stationary; the eye is always small; the separation of the retina is usually incomplete, and other congenital defects are usually present. A familial history is sometimes helpful. Our patient does not present any of these findings.

Group II. Extensive specific inflammation; uveitis with massive separation of the retina. Many agents of an infectious or of a parasitic nature could have produced the findings in this case. Against this are absence of signs of inflammation and normal intraocular pressure; however, the absence of inflammation and normal tension do not completely exclude parasitic (nematode) forms of massive separation, since these agents sometimes produce little clinical evidence of inflammation. Careful scrutiny and detailed

* Assistant Surgeon in Ophthalmology, Massachusetts Eye and Ear Infirmary.

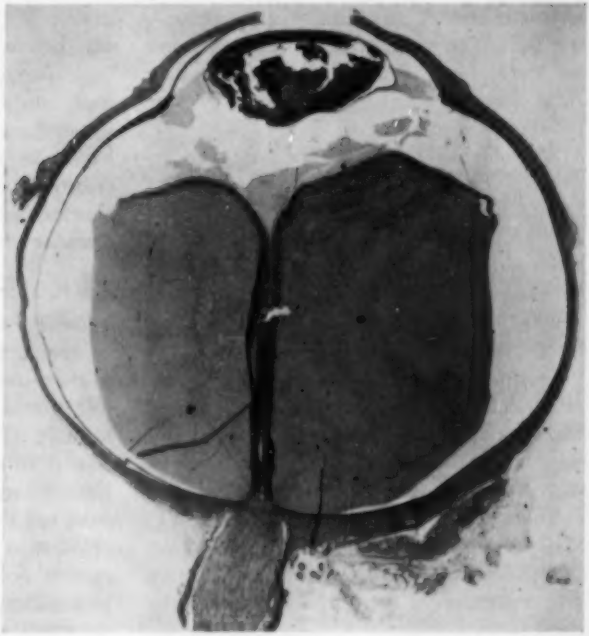

Fig. 1 (Heath). Case 2 (E-51-52). Massive separation and early organizing retina. Extensive subretinal fluid containing some fatty macrophages. Lens and iris thrust forward artefactually due to corneal decompression.

studies during the course of the process are needed to form a diagnosis along these lines.

Studies for parasites and history of exposure to family pets are sometimes helpful. Parasitic endophthalmitis usually, but again not always in early stages, causes lowered intraocular pressure. The patch of retinal degeneration reported in the protocol would be consistent with this diagnosis. Diminished transmission of light by transillumination is only a suggestive finding and must be considered only that in the presence of a massive separation.

In short, I am unable to exclude completely a possible diagnosis of parasitic endophthalmitis with massive separation of the retina.

Group III. There is a rare form of retinopathy in which the massive retinal separation occurs rapidly and is accompanied by few or no clinical signs of inflammation. There is no glaucoma, unless the anterior chamber becomes shallow from a shifting forward and blocking of the angle by an iris-lens combination. Increased vascular permeability to serum or blood is the underlying cause in this group. The retina becomes loosened and completely separated.

When the protocol is considered, I am unable to eliminate this group.

Group IV. Primary tumor of the retina. Our first thought in considering this group is retinoblastoma. The age of the patient is consistent; onset and course are typical. The absence of involvement of the second eye is not definitively against it, but is somewhat suggestive. The usual case is sporadic in appearance; when a genetic history is available the pattern is irregularly dominant.

The appearance during the early stage and the subsequent changes in this case are quite characteristic of this tumor. Multi-origins are often seen. We are not informed (or the patient came in too late) as to the very early fundus picture. The absence of calcification is some evidence against a late stage of retinoblastoma, but not conclusive.

The description of the fundus is not quite

characteristic. A mass lies over the retina—not in it. The patch of chorioretinitis would be atypical and I am inclined to consider retinoblastoma a less likely diagnosis without completely discarding it.

Angiomatosis, too, can probably be rejected. The findings do not fit. A lack of family history and central nervous-system involvement are against it. True glioma (or astromytoma because it is rare) could also be rejected, since the appearance of the fundus lesion is against such a diagnosis. Similarly, metastatic tumor can be discarded.

Group V. Traumatic separation of the retina. This diagnosis probably can be eliminated because of the appearance of the fundus and the freedom from retinal hole or tear. No history of trauma is given.

There are two possible diagnoses: (1) Massive separation of the retina and endophthalmitis due to parasites and (2) massive separation of the retina due to vascular retinopathy.

Clinical Diagnosis. Retinoblastoma.

Dr. Pollen's Diagnosis. Massive separation of the retina due to nematode endophthalmitis or vascular retinopathy.

Pathologic diagnosis

The iris and ciliary body were not fully differentiated. Massive sero-sanguineous separation of the retina with minimal or no cellular inflammation. The retina was disorganized, edematous, degenerated, and fibrosed in part, displaying some organizing recent hemorrhages in the temporal limb. The nervehead was dragged inward and the lamina cribrosa was slightly bowed posteriorly. Postenucleation decompression of the anterior chamber was present.

Comment

Dr. Parker Heath. As Dr. Pollen has told us, the clinical picture of massive separation of the retina in a juvenile stems from four or five groups of causes. These are not easy to identify clinically, but much progress in classification has been made in recent years. Early examination and appraisal is of utmost value.

What to do in the management of a given case is not so obscure. The possibility of retinoblastoma in doubtful cases, in which the eye is visually lost, calls for enucleation. In the case under discussion, the extensive retinal separation had existed long enough for degenerative changes to set in and it is possible, if the eye had been retained, that a secondary glaucoma and pain would have developed, followed in due time by a disfiguring atrophy.

243 Charles Street (14).

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Ophthalmic Miniature

> Those persons are called myopes, or near-sighted, who, from their births, see near objects, but not those at a distance. Such a state is wholly incurable, being occasioned by a weakness of the optic spirit. Old men are affected in the opposite manner to these, for they do not perceive near objects, but see those at a distance.
>
> Paul of Aegina, *Hypomnema* (circa 670 A.D.),
> From the translation by Francis Adams.

NOTES, CASES, INSTRUMENTS

MALIGNANT MELANOMA OF THE CHOROID

Report of case with evaluation of early diagnosis

J. Warren White, M.D.
Norfolk, Virginia

Malignant melanoma of the choroid can occur at any age but it occurs most frequently between the fifth and sixth decades of life. It rarely occurs in the very young.

The incidence is rare. Duke-Elder[1] states that it occurs in two to six of 10,000 patients visiting an eye clinic. It is important, however, because in every case there is ultimate destruction of the eye. It is one of the most malignant diseases, with a high mortality.

Intraocular malignant melanoma may originate in the iris, ciliary body, or choroid; only a small percentage, however, originate in the iris and ciliary body. No matter the original site, the results are the same.

In the early stage of the tumor, the patient may go on for years with the eye normal in appearance and visual acuity of 20/20. Pressure or toxic symptoms may be the first eye symptoms. It is indeed fortunate if the tumor is located in the region of the macula, so that an early detachment of the retina involves the macula, thereby causing a disturbance of vision.

The difficulty in making an early diagnosis is brought out by Terry and Johns[2] who made a study of 94 cases in which the presence of the tumor was not even suspected in 44.6 percent.

The diagnosis is made by a funduscopic examination in the early stages. However, Scarney and Crossen[3] report three eye cases studied by radioactive phosphorus at Harper Hospital. The positive tracer study was found in a proven case of melanosarcoma of the choroid. The two cases in which the studies were negative have remained clinically negative.

When glaucoma or toxic symptoms appear, the diagnosis may be very difficult to make. At this time, the haziness of the cornea makes it impossible to examine the fundus. The patient could easily be treated for a glaucoma or an acute intraocular infection. When these symptoms occur between the fifth and sixth decades of life, the possibility of a tumor should always be considered. The last and final stage is extraocular extension and metastasis.

The treatment is prompt enucleation of the eye. Even then, prognosis is poor as metastasis may occur in the earliest stages. The only way the prognosis can be favorably influenced is by an early diagnosis.

Case report

J. E. S. a 30-year-old white man, was first seen January 10, 1945, complaining of poor vision in the left eye and diplopia at times. He was a welder and had followed this occupation for the past six years.

He began to have trouble with his eyes about nine months previous to this time. He consulted an ophthalmologist who told him

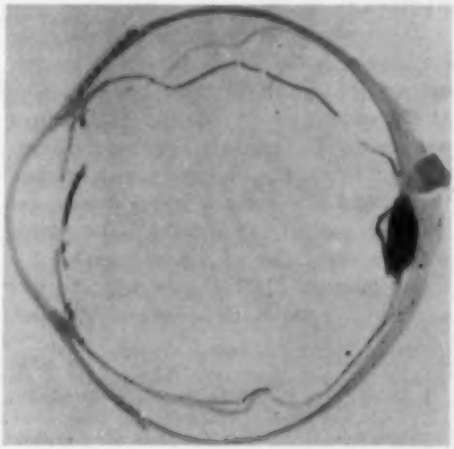

Fig. 1 (White). Magnification (× 5) of a cross section of the globe. (Army Institute of Pathology.)

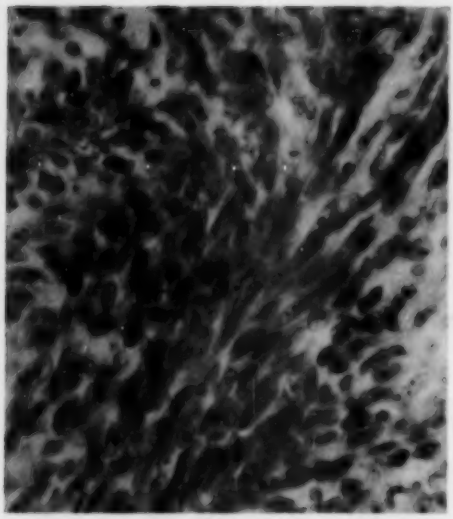

Fig. 2 (White). Magnification (×1,100) of a microscopic section of malignant melanoma. (Army Institute of Pathology. Acknowledgement is made to Dr. W. M. Monroe, United States Public Health Service, for the illustrations.)

there was an error of refraction and glasses were prescribed. He felt that the glasses gave him relief at first, and then concluded that the strong light in his work was the cause of the trouble.

The visual acuity at this time was: R.E., 20/20; L.E., 20/200.

The funduscopic examination of the right eye showed nothing remarkable, but the left eye showed a small detachment of the retina in the vicinity of the macula. This patient was sent to Dr. Guernsey Frey[4] of the Manhattan Eye and Ear Hospital for an opinion. He thought it was not a serous detachment but that a solid mass elevated the retina, which is suggestive of a new growth.

On January 29, 1945, the left eye was enucleated at the Norfolk General Hospital. The pathologic report by Dr. A. R. Crane was melanosarcoma of the choroid.

The eye was sent to the Army Institute of Pathology, Washington.

Following is the report of Helenor C. Wilder:

Gross. The specimen consists of half an eye, revealing a choroidal nodule, measuring 4.5 by 2.0 mm., adjacent to the optic disc. Part of the mass is pigmented.

Microscopic. Arising in the choroid adjacent to the optic nerve is a partially pigmented tumor which has extended into a scleral canal along a short posterior ciliary artery. The tumor is composed for the most part of spindle-shaped cells with oval nucleated nuclei. However, a few polygonal cells with round nucleolated nuclei are seen. Occasional mitoses are present.

A Wilder reticulum stain demonstrates an argyrophil fiber content of less than 50 percent. There is a serous detachment of the retina over the tumor.

Diagnosis. Malignant melanoma, Callender mixed-cell type (spindle-cell subtype B and large epithelioid, predominantly spindle B) of the choroid; detachment of retina.

On November 10, 1952, the visual acuity was: R.E., 20/15. The funduscopic examination was completely normal.

Now over eight years after enucleation, the prosthesis has excellent movement and the general health of the patient is good. He has changed his work from a welder to the owner of a gasoline station.

This case report demonstrates the importance of a history and diagnosis in every case of visual disturbance before prescribing for an error of refraction.

618 Medical Arts Building (10).

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CARCINOMA OF THE MEIBOMIAN GLAND*

A CASE REPORT

ROSCOE J. KENNEDY, M.D., AND
ROBERT W. KING, M.D.
Cleveland, Ohio

Primary carcinoma of the meibomian gland is of clinical importance, primarily due to its dangerous potentialities of rapid extension when inadequately treated.[1] It has only recently been described in ophthalmic textbooks.[2]

The excellent review of Lebensohn[1] was augmented by Rice and Lindeke[3] whose case report made a total of 13 described in the American literature. One case has since been published.[4]

CASE REPORT

A 54-year-old white woman was first seen by an ophthalmologist in March, 1951. At this time the palpebral and bulbar conjunctivas of both eyes were severely inflamed and accompanied by a mucopurulent discharge. The cornea of the left eye showed many infiltrates, some of which stained with fluorescein. Smears and cultures revealed the presence of D. pneumoniae and M. pyogenes albus. There were no inclusion bodies present.

The patient later developed a chronic conjunctivitis in the left eye with the cornea manifesting intermittent ulcers and subsequently becoming vascularized. She was treated with oral and topical cortisone, bacitracin ointment, sodium sulfacetimide ointment and solution, zinc-sulfate drops, aureomycin ointment, antistine drops, terramycin ointment, and by painting the lids with silver nitrate. Improvement was insignificant.

When first seen in the Ophthalmologic Department of the Cleveland Clinic in January, 1952, the examination revealed a chronic keratoconjunctivitis of the left eye. The vision had been reduced to counting fingers at three feet without correction and 6/60 with correction. The lids were thickened, and the lid margins were red. The conjunctiva was noticeably injected and accompanied by a watery mucoid exudate. Inside the lower lid margin was a relatively small, irregular yellow elevation of the palpebral conjunctiva. This was grossly diagnosed as a chalazion. Smears and cultures were reported as negative preoperatively and at operation.

Fig. 1 (Kennedy and King). Circumscribed masses of neoplasm with irregular vacuolation and sheets of dark-staining cells (×70).

Pathologic report. Biopsy from the site described showed fibrous tissue including islands of atypical epithelial cells which appeared to be sharply circumscribed in so far as distortion of certain areas permitted examination. The cells were of medium size, round or polyhedral, and the nuclei showed fairly pronounced variation, both in staining and size. Centrally, and also irregularly placed, were cells containing clear vacuoles of variable dimension. Pathologic diagnosis was carcinoma, apparently in situ, of the meibomian gland.

* From the Cleveland Clinic and the Frank E. Bunts Educational Institute.

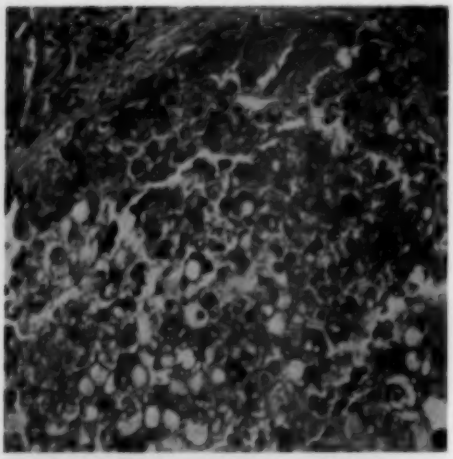

Fig. 2 (Kennedy and King). Atypical cells forming circumscribed neoplastic island. Nuclei vary in shape, staining, and size, and show irregular vacuolation (×250).

Discussion

The neoplasm occurs predominantly in women over 40 years of age and is found twice as often on the upper lid. In early stages it is relatively benign, often requiring a year to attain noticeable size.[1] Most patients have a history of previous surgical excision and curettage of a chalazion.[5, 6] Once inadequately treated surgically, it may demonstrate tendencies varying from frequent recurrences[1, 7] to rapid orbital extension,[3] and occasional preauricular lymph node involvement.[1, 8]

No adequate comparison between incidence of the neoplasm and other epitheliomas of the eyelids is available. Lazarescu,[7] over a period of 13 years, reported one case in 25 instances of carcinoma of the eyelids. A recent review[8] failed to list a case in 301 consecutive tumors of the eyelid. None was mentioned in Spaeth's[9] collection of 170 ocular tumors. Reese[2] describes, in 355 orbital tumors, one case of secondary extension into the orbit.

Lebensohn[1] indicates that carcinoma of the meibomian gland has no relation, present or past, to inflammatory reaction except that, grossly, it may have the appearance of a chalazion. In Rice and Lindeke's report,[3] the patient had a purulent conjunctivitis two years prior to biopsy. Reese[2] believes that carcinoma of the meibomian gland is capable of causing an inflammatory reaction, and that some product of the tumor growth incites an inflammatory reaction which may conceal the neoplastic lesion.

Inasmuch as there has been no suggestion of this relationship in the earlier literature, the presence of the inflammatory process prior to biopsy is, in this instance, an interesting one. One may only speculate as to whether the keratoconjunctivitis may have concealed and enhanced the neoplastic growth.

Summary

This report of a carcinoma of the meibomian gland is presented because of the rarity of this condition. Only 14 cases have been recorded previously in American literature. This instance emphasizes the fact that questionable or recurrent chalazions should be studied histologically.

2020 East 93rd Street (6).

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A NEW ATTACHMENT FOR THE PROJECTION PERIMETER*

BRUNO S. PRIESTLEY, M.D.
AND
MYER M. MEDINE, M.D.
New York

Mechanical perimeters are constantly being used and perfected though many perimetrists do not favor them. They object to the lack of flexibility, to the noise of the carrier, and to the complexities of the apparatus.

A considerable advance was made by Maggiore when he substituted a beam of light for the noisy and bulky carrier. The spot of light can be moved silently at any desired speed and can be regulated as to size, intensity, and color in an instant by rotation of the Recoss discs.

The proposed attachment to the projection perimeter makes it possible to move the test object rapidly at right angles to the perimeter

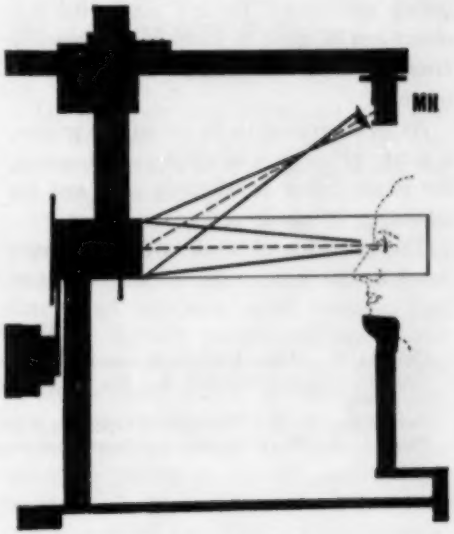

Fig. 1 (Priestley and Medine). A lateral view of the Maggiore projection perimeter. The attachment is supported by the mirror housing (MH).

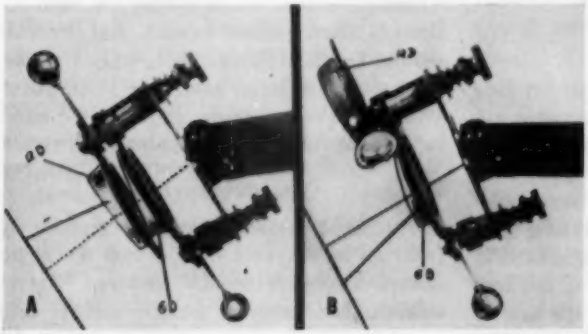

Fig. 2 (Priestley and Medine). The interrupted line depicts the path of the light rays without the attachment. The continuous line shows the deflection of the test object (a) with both prisms in place and (b) with one prism displaced.

arc. The usefulness of such technique in perimetry has been demonstrated many times.

Chamlin, in his "rapid comparison" test, has shown the value of vertical meridian defects in the diagnosis of hemianopia and of nasal horizontal meridian defects in the demonstration of an early Rønne's step. The method that he describes—namely, moving the same test object from side to side—requires memory on the part of the patient and dexterity on the part of the operator. In order to facilitate this test on the Maggiore projection perimeter the following attachment has been devised.

A metallic sleeve is attached to the mirror housing of the project perimeter (fig. 1) which supports two prisms, six and 12 prism diopters, respectively, oriented base to base or apex to apex (fig. 2). The former is fixed in position, the latter can be rotated in front of it and can be readily displaced with the

* From the New York Eye and Ear Infirmary, service of Dr. Raymond E. Meek.

spring mechanism. By this means, the test object can be made to jump instantaneously from one margin of the perimeter arc to the other.

As an alternative to the use of two prisms, a rotary prism may be employed. However, the rotary prism is relatively slow and the advantage of rapid comparison is lost.

The added use of a yellow filter, incorporated in the Recoss disc of the Maggiore projection perimeter, is helpful in reducing chromatic aberrations.

Summary

A simple attachment to the Maggiore projection perimeter is described. It enables the operator to employ the technique of "rapid comparison."

57 West 57th Street (19).

We are indebted to Mr. Arturo Levi, who constructed the attachment described.

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CAROTID-CAVERNOUS FISTULA

Truman L. Boyes, M.D.

and

Fenn T. Ralph, M.D.

New York

This paper presents two cases of carotid-cavernous fistula with some uncommon aspects, and introduces a method of determining early pulsation of the globe when both digital and visual methods reveal nothing.

The carotid-cavernous fistula has long been known, and its manifestations are dramatic and occasionally fatal. In view of the fact that the ophthalmologist is often the first to see the patient, he should be familiar with its diagnosis, treatment, and prognosis. This is especially important when it is realized that, even though he will make the diagnosis, treatment will rest within the province of the neurosurgeon.

Etiology

Carotid-cavernous fistula is a communication between the carotid artery and the cavernous sinus. It is of two etiologic varieties: (1) The traumatic type which accounts for about 75 percent of cases[1, 2]; the spontaneous type responsible for the remaining 25 percent.[1]

According to Kestenbaum,[2] spontaneous carotid-cavernous fistula is very uncommon. Head injuries, gunshot wounds, and so forth account for the traumatic type, while a weakening of the arterial wall, due to sclerosis with subsequent rupture, provides the etiologic background for the spontaneous type.[4]

Occurrence

Traumatic cases are usually seen in men from 30 to 50 years of age, and the right carotid artery is usually involved. Spontaneous cases occur in women, and the left carotid artery is most commonly affected.[3]

Signs and symptoms[4]

The signs and symptoms of carotid-cavernous fistula are due to the location and nature of the pathologic process. The cavernous sinus communicates with the ophthalmic veins and, with each thrust of the carotid pulse, blood pours into the cavernous sinus and forces the venous blood draining the globe and orbit backward, causing stasis and engorgement of the retinal and retrobulbar veins. The engorgement causes edema and

exophthalmos with the formation of a caput medusa anteriorly.

Preceding the exophthalmos, the initial symptom may be a severe localized headache, usually on the side of the fistula, with buzzing or swishing noises in the head. At this time, a bruit is heard, not only by the patient subjectively, but by the ophthalmologist through use of the stethoscope. This bruit is variously described by the patient as being a swishing, roaring, cracking, blowing, or buzzing sound. It is noteworthy that these sounds diminish when the carotid is compressed digitally.

In view of the fact that the third, fourth, and sixth cranial nerves are located, either in the sinus itself, as in the case of the sixth nerve, or in the wall of the sinus, as with the third and fourth nerves, the extraocular muscles are involved in about 60 percent of cases.[5] When involved, the sixth nerve accounts for about 62 percent, the third nerve 28 percent, and the fourth nerve for about 10 percent of cases.[6]

Intraocular signs reveal, in a majority of cases, marked engorgement of the retinal vessels, particularly the veins, and a low-grade papilledema. In some cases, the veins are not dilated, the explanation being that the retinal veins empty into the inferior ophthalmic vein and thence into the pterygoid plexus rather than the cavernous sinus.

Glaucoma was found by Sugar and Meyer[7] in 11 of 171 cases of pulsating exophthalmos. In long-standing carotid-cavernous fistula, some cases will show optic atrophy.

X-ray changes[8]

In the early cases of carotid-cavernous fistula, there is no roentgen evidence. However, later X-ray studies may show erosion of the orbital walls, and, more commonly, the sphenoid and sella turcica. This erosion is slow and five years may pass before objective evidence is revealed by X-ray.

Angiography also may be used to reveal early changes, the technique being an injection of Diadrast into the carotid artery followed by a series of X-ray pictures which may or may not reveal the fistula.

Treatment[1]

The procurement of thrombosis is the goal of all treatment, and appears to be most successfully obtained in those patients who are given absolute bedrest.

The common carotid artery is ligated if possible, preceded by trial periods of digital compression six to eight times daily for one minute and increasing to 45 minutes. The artery is digitally compressed against the tubercle of the sixth cervical vertebra. If no untoward effects result in 10 minutes, it is considered safe to ligate the common carotid artery. In those cases in which the patient is over 40 years of age, or in which this preliminary compression causes cerebral excitement, an incomplete ligation is done.

A method for "trapping the aneurysm" was introduced by Adson,[9] and devised by Dandy.[5] The procedure consists in the ligation of the carotid and the ophthalmic arteries.

Prognosis of carotid-cavernous fistula[1]

In traumatic cases, a carotid-cavernous fistula may exist many years without any appreciable harmful results, with the exception of the visual acuity which is reduced in almost 90 percent of cases. A large majority of patients will, however, require surgery because of the noise which the fistula creates. The spontaneous case is not usually so fortunate because at least half of these end in death.

The visual acuity in about 20 percent of cases is reduced to the point of blindness, regardless of whether treatment is instituted or not.[4] The surgical treatment will, however, reduce the exophthalmos, and in most cases abolish the disturbing bruit.

Spontaneous cure due to thrombosis is uncommon, according to Sattler,[6] one in 20 cases. Sugar and Meyer report only four cases of spontaneous cure from 1927 to 1939.

Case reports

Case 1

Mr. J. R., aged 67 years, first appeared for examination March 3, 1951, with the chief complaint of severe pain over the left eye. There was no history of previous eye complaints except the wearing of reading glasses for many years, and no history of systemic disease.

Examination of the eyes revealed a corrected vision of 20/20, O.U. The tension (Schiøtz) was: O.D., 25, mm.Hg; O.S., 33 mm.Hg. The rest of the examination was completely within normal limits. No treatment was given, and the patient was advised to return for re-examination in two days if the pain persisted.

On March 5th, there was still severe pain in the left eye but not quite so severe as it had been; otherwise, the examination was negative.

Examination on April 27th revealed some pain and tearing of the left eye but no real discomfort. Examination was otherwise completely negative. The patient was advised to return for a check in two months.

Irritation persisted in the left eye on June 15th, with the feeling of a foreign body. Examination revealed a mild catarrhal conjunctivitis with some dilation of the bulbar conjunctival vessels. Nothing else was found. Treatment for the conjunctivitis consisted of antibiotic drops and ointment. The patient was advised to return if the irritation continued.

On July 6th, the patient still complained of irritation of the left eye, but the examination was absolutely negative.

By July 24th, there was severe irritation in the left eye of one day's duration. Examination showed a slightly chemotic bulbar conjunctiva, O.S., with some dilatation of the vessels. A diagnosis of episcleritis was made and cortisone therapy, locally, was instituted.

On September 24th, no change was apparent, the chemosis and dilated vessels still being present. The cortisone had been discontinued one month earlier. X-ray examinations of the globe, orbit, and the optic foramina were all negative.

The patient was re-examined seven different times between September 24, 1951, and December 13, 1951, with absolutely no demonstrable changes in his status.

One month later, on January 13, 1952, the patient felt severe pain in the left eye concomitant with a roaring sound in the left side of his head, the noise being evident only on reclining.

Upon examination the tension was found to be: O.D. 14 mm.Hg; O.S., 33 mm.Hg (Schiøtz). The indicator hand on the tonometer described a to-and-fro arc of six to eight divisions on the scale, these movements being synchronous with the carotid pulse. In routine tensions, a movement of one or two divisions is often noted.

The globe was not seen to pulsate, nor was the movement felt when the globe was palpated digitally. A bruit was heard over the left cranium, much louder when the patient reclined.

The diagnosis of pulsating exophthalmos on the basis of the "tonometer sign" and bruit was made, and a carotid-cavernous fistula was believed to be the underlying pathologic condition.

On February 13, a caput medusa formed, and the retinal veins were observed to be dilated. A neurologic consultation was requested but the patient was reluctant to appear for the examination.

The case was followed with periodic examinations, and no change in the signs and symptoms was recorded until June 11, 1952, when no bruit was heard by either patient or doctor. The caput medusa appeared less pronounced, and the retinal vessels were normal. The fistula appeared to have undergone spontaneous thrombosis.

The patient was followed periodically for one year with no recurrence of the signs or symptoms.

CASE 2

Mrs. M. C., aged 62 years, was first examined on October 30, 1951, with the chief complaints of diplopia and a red, irritated right eye of one week's duration. Blood examination, consisting of complete blood count and glucose tolerance test, was negative as were X-ray films of the skull and sinuses.

The ophthalmic examination revealed complete paralysis of the right lateral rectus, and ptosis of the right lid. The rest of the examination was negative. The vision was 20/25, O.U., with correction.

Treatment consisted of penicillin, 300,000 units daily for six days.

On November 17th, the patient was reexamined, and a slight exophthalmos (Luedde) O.D., 23 mm., O.S., 14 mm., was noted. The veins in the fundus of the right eye were moderately dilated. The patient complained of swishing noises in her head.

The "tonometer sign" for pulsation was markedly positive, and the tension (Schiøtz) was: O.D., 40 mm.Hg; O.S., 23 mm.Hg. The patient was admitted to the hospital for further study, and a neurologic consultation was requested.

On December 1st, the visual acuity was 20/25, O.U., with correction. No bruit was heard, and the remainder of the examination, including the "tonometer sign" for pulsation, was negative.

Ten days later, December 10th, the patient experienced sudden pain in the right eye, with clouding of the visual acuity. The tension was: O.D., 23 mm.Hg; O.S., 17 mm. Hg. The Luedde exophthalmometer revealed O.D., 23 mm., and O.S., 17 mm. The visual acuity with correction was finger counting at one foot in the right eye and 20/25 in the left. The fundus showed edema of the macula and a detachment of the retina above.

A neurologic consultation was advised, but the patient did not appear for the examination until December 12th. The neurologic report gave the diagnosis as a carotid-cavernous fistula preceded by a carotid aneurysm secondary to arteriosclerosis and hypertension. The report was substantiated by arteriography. Diodrast was injected into the right carotid artery and seriographic X-ray films were taken.

By January 7, 1952, the vision in the right eye had returned to 20/40, and the exophthalmos was almost gone. The patient was examined periodically from January, 1952, through September, 1952. The examination in September was normal except for some engorgement of the conjunctival vessels. The vision, with correction, was 20/20, O.U.

COMMENT

It will be noted that these cases of carotid-cavernous fistula present certain uncommon clinical features:

1. Both cases were of the spontaneous type which is uncommon.[3]

2. Spontaneous cure through thrombosis without treatment is rare.[6, 7]

3. The fact that the visual acuity was found to be normal after one year is unusual.[1, 4]

4. Patients survive in less than 50 percent of the spontaneous cases.[1] Both cases have been followed for one year and no mishap has occurred.

5. Glaucoma is not a usual finding in carotid-cavernous fistula.[7] In both cases secondary glaucoma developed at some stage and disappeared with the onset of thrombosis.

6. Case 2 developed a retinal detachment which disappeared spontaneously. This is an uncommon observation.

7. The "tonometer sign," observed by one of us (F. T. R.) was present in both cases before the globes were noted to pulsate, either visually or by palpation.

SUMMARY

1. A short resume of the clinical aspects of the carotid-cavernous fistula has been attempted.

2. Two cases with some unusual clinical aspects have been presented.

3. A method of determining early pulsation of the globe by use of the "tonometer sign" for pulsation has been described.

654 Madison Avenue (21).
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Ophthalmic Miniature

The functional loss may be recognized if the macula is not involved, because the central acuity remains intact for a long time in comparison with the damage to the visual field. This is especially striking in cases of advanced loss of function. One sees the visual field shrinking more and more from the inner side, nearing the fixing point. When close to the fixing point, we see the central area encircled by two spurs, from above and below, finally uniting external to the fixing point, producing a divided visual field; a small central oval and a peripheral area. The eccentric area disappears, leaving only the small central area. . . . This latter stage may be very long, in which case, the facts are more evident. This symptom attains greatest diagnostic importance in glaucoma chronicum and in those closely allied forms of amaurosis found in old people with rigid arteries.

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SOCIETY PROCEEDINGS

Edited by DONALD J. LYLE, M.D.

MEMPHIS SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

April 14, 1953

DR. R. O. RYCHENER, *presiding*

GLAUCOMATOCYCLITIC CRISIS

DR. J. WESLEY MCKINNEY reported the case of Mrs. R. J. H., aged 65 years, who was first seen on February 11, 1949.

She gave a history of having had a small anterior-chamber hemorrhage in the right eye on 12 occasions in the preceding 15 years. She came in thinking that she had another hemorrhage in the right eye because the vision was cloudy.

Her vision was corrected to: R.E., 20/25; L.E., 20/20. The tension was: R.E., 46 mm. Hg (Schiøtz); L.E., 28 mm. Hg. The right eye showed faint pericorneal injection, a wide angle, and a small blood clot on the face of the iris near the pupillary margin at the 7-o'clock position. The right pupil dilated irregularly and reacted sluggishly. No definite source of the hemorrhage could be made out. The media were clear and the fundi were normal. At this time there were no keratic precipitates or other evidence of iridocyclitis.

Two percent pilocarpine caused intense ciliary spasm, pain, and blurring of vision, but the tension came down to 20 mm. Hg (Schiøtz), each eye, within three days. Pilocarpine was discontinued without return of hypertension.

Since that time, the tension has been found to be between 30 to 31 mm. Hg (Schiøtz) in each eye, but the visual tests and fields, including angioscotoma, have continued to be normal to the present date. Consequently, no drops have been used.

On July 2, 1949, she awoke with slight pain and blurred vision in the left eye (the right eye was the one having the hemorrhages). The tension was: R.E., 23 mm. Hg (Schiøtz); L.E., 35 mm. Hg. The left eye showed slight pericorneal injection and a fine web on the corneal endothelium with cell clumps in the anterior chamber. There were some old pigment deposits on the anterior capsule of the lens. She was put on atropine once daily.

On July 18th, 16 days after the onset, all symptoms and signs had disappeared, and the tension was 26 mm. Hg (Schiøtz) in each eye. The vision was not impaired during this attack.

On December 5, 1949, she awoke with the blurring of vision in the right eye. The tension was 35 mm. Hg (Schiøtz) in each eye, and there were a few cells in the anterior chamber of the right eye only. No treatment was given, and the tension returned to normal, or rather her normal, in one week.

On January 24, 1950, she arose with another attack of blurring of vision in the right eye. Tension was: R.E., 37 mm. Hg (Schiøtz); L.E., 32 mm. Hg (Schiøtz). Again there were cells in the anterior chamber, right eye. No treatment was given, and the tension returned to her normal in one week. Tension continued between 20 and 30 mm. Hg (Schiøtz) for the most part.

In June, 1950, the tension was found to be 35 mm. Hg (Schiøtz) in the right eye and 32 mm. Hg (Schiøtz) in the left. There were no cells in the anterior chamber. Since that time, she has been able to use pilocarpine (one percent) without discomfort. Tension has remained, for the most part, between 27 and 30 mm. Hg (Schiøtz) in each eye. The vision in each eye is 20/20, and the fields are completely normal. Physical examinations have been made repeatedly.

Corneal dystrophy

Dr. M. I. Shatir presented a Negro, aged 48 years, who had been followed in the clinic because of chronic glaucoma, O.U., which had been well controlled with two-percent pilocarpine three times a day.

The present examination showed vision to be: O.D., 20/30, unimproved with glasses; O.S., 20/30, unimproved. There was no history of trauma or infection, and no history of corneal dystrophy.

Further examination revealed that there was a horizontal, bandlike opacity in the cornea of the right eye. It was situated in the exposed interpalpebral zone and the lines interlaced the superficial corneal stroma and Bowman's membrane which resembled Chinese characters and gave the cornea a matted, latticelike appearance. A few round dark holes, varying in size, were scattered through the opaque lesion.

The epithelium was not affected for it passed over the lesion. No staining area could be demonstrated. The periphery of the lesion was sharply demarcated but the remainder of the cornea was relatively clear.

Except for arteriosclerotic changes of the retinal vessels, the fundus examination was negative. The laboratory findings were negative.

Obstruction of canaliculi

Dr. M. J. Davis presented Mr. J. H. R., aged 49 years, who complained of epiphora of the right eye following a severe attack of "pink eye" 15 years ago.

Examination revealed a complete obstruction of the lower and upper canaliculi at the junction of the lacrimal sac, right eye. The remainder of the ocular, physical, and laboratory examinations were within normal limits.

Under pentothal anesthesia, a No. 16 Viers needle with a sharp stylet was passed into the lower caniculus and forced through the stricture and the bone of the lacrimal fossa into the middle meatus of the nose. A 1.27-mm. polyethylene tube was then passed through the needle, which was then removed. The tube was cut just below the punctum.

Since surgery, there has been a decrease in tearing. The tube, now in place over one month, has caused no difficulty. It will be removed in another two months.

Epithelial downgrowth

Dr. J. B. Cross presented a woman, aged 69 years, who was first seen in the clinic of the Memphis Eye, Ear, Nose, and Throat Hospital on January 11, 1952, with cataract, O.U. Visual acuity was: O.D., hand movements; O.S., counting fingers and J20, without glasses. The visual acuity could not be improved. The patient had glaucoma 25 years ago which had been relieved at that time by surgery.

Examination showed a broad-based iridectomy, O.U., deep anterior chambers, globes soft on palpation. Blood pressure was 160/105 mm. Hg; urinalysis was negative.

Operations for the cataracts were performed on January 16th and 19th. The extraction, O.D., was intracapsular, O.S., extracapsular. Hospital recovery was uneventful and the patient was discharged on atropine and boric-acid lavages daily. When she was seen in the clinic at the end of the month, some cortical material remained in the anterior chamber of the left eye. She was continued on the regular routine.

On February 8th, the patient was put on Cortone drops for, although subsiding, inflammation was still present in the left eye. She was seen in a week and again two weeks later. The cortical material appeared to be clearing from the left eye.

When the patient returned in mid-March, conjunctival inflammation was still present and, in addition, entropion was noted. This was reduced with adhesive tape for two weeks. The tape was left off one week and the entropion returned. Ziegler puncture lines were made in the lower lid and the entropion was relieved in a couple of weeks. The conjunctival inflammation continued, however. It was thought drug sensitization might have

developed, so all medication was withheld for two weeks.

By the first part of June, the inflammation of the conjunctiva was still present and a generalized cloudiness of the upper half of the anterior chamber had developed. Early vascularization was noted. A diagnosis of epithelial downgrowth was made.

The patient was referred for X-ray irradiation and received eight treatments of 200 to 300 r each over a two-week period. At the end of this time the cloudiness of the anterior chamber appeared to be clearing. However, the hyperemia of the conjunctiva and skin continued. During July, the cloudiness and vascularization decreased and the hyperemia was relieved.

In August, however, clearing ceased and more new vessels were seen in the anterior chamber. One month later the cloudiness was clearing but several irregular, cystlike formations were seen in the upper portion of the anterior chamber. Vascularization was continuing.

Although visual acuity had greatly improved and pain was completely relieved, two more treatments of 200 to 300 r of X-ray irradiation were given in an attempt to reduce the vascularization and the cloudy cystlike formations.

Cortisone to treat burns

Dr. Philip Meriwether Lewis reported three cases of burns of the cornea and conjunctiva treated with cortisone.

Case 1. E. C., a Negro, aged 50 years, was burned on August 15, 1952, by liquid sulfur dioxide (refrigerator fluid) spurting into both eyes. He was seen within an hour after the accident.

Both corneas were a dull-gray color and stained with fluorescein over the entire surface. The conjunctiva was wrinkled and grayish white. Vision was reduced to counting fingers at 18 inches.

The eyes were irrigated copiously, atropine and cortisone were instilled. Sedatives were administered. He was then sent to the Memphis Eye and Ear Hospital and treated every hour, day and night, with saline irrigations and cortisone ointment (Cortone 1.5 percent Merck).

The right cornea was more involved. In spite of foreign-protein injections and antibiotics locally and systemically, a central ulceration of the right cornea failed to heal. On the 25th day after the injury, a conjunctival flap was placed over the cornea.

One week later he was dismissed from the hospital but continued to use cortisone ointment three times a day. Two weeks later healing was complete. There was practically no vascularization of the cornea at any time.

To promote absorption of the scar tissue two-percent choline-chloride solution was used four times daily. Massage of the cornea with yellow oxide ointment was used every other day. Vision gradually improved to 20/25 plus.

The left eye which was burned less deeply healed quickly without any scarring or visual loss.

In a similar case, V. J., burned to about the same degree with the same chemical, was treated exactly the same way except that Hydrosulphosol* was used instead of cortisone (January to July, 1951). Fortunately only one eye was involved, because marked vascularization and permanent scarring occurred and the final vision was only 20/100.

Case 2. J. E. J., a white man, aged 37 years, was struck in the right eye with a hot rivet. He was treated in another city until the 11th day after injury when he was transferred to the Memphis Eye and Ear Hospital.

At that time there was a deep burn of the lower half of the cornea, the conjunctiva of the lower half of the globe, and the lining of the lower lid. The eye was extremely painful and highly congested. Vision was only 3/200. Treatment was started with cor-

* Hydrosulphosol is the registered trademark of the E. C. Lientz and Co., Inc., for their brand of sulfhydryl.

tisone ointment every hour, night and day. In addition, fever therapy and antibiotics were employed.

Improvement was rapid. When he left the city three weeks later, the vision had improved to 20/60.

Case 3. S. N. S., a white man, aged 38 years, had a moderately severe lime burn of the cornea and conjunctiva of the right eye. His first aid treatment had been inadequate so that, when seen about one hour later, considerable lime remained caked beneath the upper lid. Copious irrigations, followed by cortisone ointment, were used every two hours at the Memphis Eye and Ear Hospital. The relief of pain without the necessity of local anesthetics was a marked feature of this case. He was dismissed from the hospital in seven days with complete healing. There was no vascularization of the cornea.

Comment. The results of treatment of burns of the cornea and conjunctiva with cortisone ointment have been most satisfactory and at times spectacular. Reduction of inflammatory reaction, relief of pain, and lack of vascularization have been noticed in all cases. It is also my opinion that the density of the scarring is decreased and that better visual results are thereby obtained.

Daniel F. Fisher,
Recorder for Eye Section.

YALE UNIVERSITY CLINICAL CONFERENCE

February 13, 1953

Dr. R. M. Fasanella, *presiding*

Carcinoma of eyelid

Dr. Clement C. Clarke, assistant clinical professor of ophthalmology, Yale University School of Medicine, presented and discussed the clinical course over a 16-year period of an interesting case of carcinoma of the eyelid in a man now 72 years of age.

In June, 1936, the patient, a Norwegian carpenter, then aged 56 years, first noted a nodule in the left upper lid. Nothing was done for eight months when a dentist friend cauterized the lesion. In January, 1938, a biopsy at New Haven Hospital tumor clinic proved the lesion to be a squamous-cell carcinoma. At that time, the patient was treated on the general surgical service and an excision was done with full-thickness graft from the supraclavicular region.

Eight years later, in June, 1946, a recurrence developed, proved by biopsy, and this was treated by 6,030 r of X-ray therapy. In September, 1946, eye complaints developed which subsequently were considered to be X-ray keratitis. Vision was: O.D., 2/200; O.S., 20/30.

In March, 1948, a biopsy revealed recurrent carcinoma and the Eye Service advised against further X-ray therapy. Accordingly, a block incision of two thirds of the left upper lid was done, with a large temporal sliding graft. Keratitis continued. Revision of the lid was done in March, 1949, and, in July, lid adhesions were necessary because of pain and deterioration of the cornea. These were opened in May, 1950, at the patient's demand.

For the next year, a contact lens was used as therapy for the keratitis and also afforded somewhat better vision. In March, 1952, the cornea was noted to be badly abraded by the patient's rubbing.

From March to October, 1952, reconstruction of the left upper lid was done in several stages. Fairly good closure of the lids resulted, with less corneal exposure. In January, 1953, comfort was further improved by supraorbital nerve alcohol injection. Final vision was: O.D., 20/200; O.S., 20/100.

In his discussion, Dr. Clarke emphasized the following points:

1. In an elderly active man with many hyperkeratotic areas, it was one and a half years before adequate diagnosis of a lid nodule was made and proper therapy begun. In retrospect, it seems that the original excision was too conservative and that block dissection was indicated from the beginning.

2. An incurable and excruciatingly painful keratitis resulted from conservative (and unsuccessful) X-ray therapy.

3. The use of a contact lens in this corneal lesion, to administer medications and protect against exposure and improve vision, was found to be practical.

William I. Glass,
Recording Secretary.

NEW YORK SOCIETY FOR CLINICAL OPHTHALMOLOGY

January 5, 1953

DR. ABRAHAM L. KORNZWEIG, *president*

VISUAL DEFECTS DUE TO OPTIC ATROPHY AND FIXATION NYSTAGMUS

DR. MORTON NATHANSON, DR. P. S. BERGMAN, AND DR. MORRIS B. BENDER said that blurring of vision is a common complaint of patients with multiple sclerosis and is usually attributed to the pallor of the optic discs (or "bitemporal pallor") frequently observed in this condition. In studying patients with acquired nystagmus on direct forward gaze (fixation nystagmus), they found that they all complained of blurred vision. More detailed description of this symptom disclosed that the visual disturbance was actually oscillopsia, a visual sensation in which objects appear to be moving rapidly from side to side or up and down (oscillating).

It has been observed that intravenous injections of barbiturates temporarily abolish fixation nystagmus and the associated sensation of oscillopsia. This investigation consists of the administration of intravenous barbiturates to eight patients with and without evidence of optic pallor in the presence of nystagmus on direct forward gaze. When the nystagmus has been abolished, it is possible to evaluate the visual acuity and thereby determine whether or not the clinical finding of optic pallor is of pathologic significance. The eye movements were recorded electrically in order to eliminate the deficiencies of naked-eye observation and provide permanent records.

All the patients showed the combination of defective vision, oscillopsia, and nystagmus on direct forward gaze. Four of them had pallor of the optic discs of sufficient degree to consider pathologic involvement.

Tests for visual acuity were made prior to and after administration of intravenous sodium amytal in small doses (50 to 150 mg.) which did not interfere with co-operation. The eye movements were recorded by means of an electro-encephalograph, which amplified the corneoretinal potential.

In every case, amytal abolished the nystagmus on direct forward gaze and the accompanying oscillopsia, so that vision was improved significantly. The electrical recording of the eye movements showed for the first time that all that was necessary for the disappearance of the oscillopsia was a change in the character of the nystagmus. The complete cessation of the nystagmus always lagged behind the improvement in visual acuity; when the effect of the drug wore off the nystagmus returned first, usually in short runs of lower amplitude, but oscillopsia or blurred vision did not reappear until the nystagmus became continuous at its previous rate and character.

To what extent optic pallor in the presence of nystagmus on direct forward gaze produces visual disturbances can only be determined by stopping the nystagmus and comparing the visual acuity before and after. The frequently equivocal clinical impression of "optic pallor" or "temporal pallor" may prove not to be of pathologic significance.

The visual acuity of several patients with optic atrophy who had no evidence of abnormal ocular movements on direct forward gaze was not measurably improved following intravenous sodium amytal.

A known barbiturate given in such a way so as to eliminate side effects, or a new drug without such side reactions, may some day

prove capable of correcting these abnormal movements when given by mouth in clinically feasible doses.

Discussion. Dr. Alfred Kestenbaum said that the observations made in this paper are very important. The disappearance of nystagmus after administration of barbiturates can be compared to the disappearance of nystagmus in sleep. He mentioned that there is another method by which nystagmus can be eliminated, thus allowing the real visual acuity to be measured.

In most cases, there is one direction of gaze in which the nystagmus is very small or disappears. The visual acuity in this direction can then be measured. Dr. Kestenbaum mentioned a case in which the patient showed severe nystagmus in forward gaze, bitemporal pallor of the discs, and visual acuity of 20/150, right eye, and 1/30, left eye. It had been assumed that the loss of vision was due to disease of the optic nerve (multiple sclerosis).

Examination revealed that, when the patient looked to the left, the nystagmus disappeared. Testing the visual acuity in this position revealed the vision to be 20/50 in the right eye and 10/300 in the left eye. The poor vision in the right eye was, therefore, due to the nystagmus. This patient was operated so that both eyes were turned to the right and, in direct forward gaze, the nystagmus was almost eliminated. Postoperatively, the vision became 20/30, right eye, and 10/200, left eye, and the patient was able to work again.

Dr. Chamlin said that he uses the method of plotting the visual field in the position where the nystagmus is least and he felt that this method is very good. He said that accurate fields can be plotted this way in cases in which it would ordinarily be impossible to plot the fields.

Dr. Fread asked if the same effect could be produced by administration of amytal in other ways. He also asked whether tolserol has been studied similarly. He mentioned that, after sodium pentothal, there is a type of nystagmus which appears as the patients come out of the anesthesia and which may recur spontaneously weeks after the anesthesia.

Dr. Morris B. Bender replied to Dr. Kestenbaum: In congenital nystagmus there is no oscillopsia. In latent nystagmus there is an oscillopsia which can be demonstrated by covering one eye. Quite accidentally I found that intravenous injections of sodium amytal abolished nystagmus on direct forward gaze, whether it be the congenital or acquired type.

Abnormal movements other than those shown by the eyes can also be abolished by amytal. Thus, chorea is readily stopped by intravenous amytal. Cessation of dyskinesia is also noted during sleep. As a matter of fact, nystagmus on forward gaze also stops during sleep.

To Dr. Fread, Dr. Bender replied that oral administration of barbiturate does not abolish the nystagmus unless very large doses are used; then the patient falls asleep. Tolserol by mouth has no effect. Only when the tolserol is given intravenously does it cause cessation of the nystagmus.

In pentothal anesthesia, there is a nystagmus as the patient comes out of the anesthesia. This is characteristic of all barbiturates when given in sufficient doses. However, this type of nystagmus is apparent only on deviation of the eyes to any one side—not on forward gaze. Why this sort of nystagmus recurs weeks after the pentothal was given, cannot be answered.

Optic neuritis: Pathologic studies

Dr. Samuel Gartner said that 14 eyes were obtained from 10 cases in which the diagnosis of multiple sclerosis was verified at autopsy. All showed some changes either in the optic nerves or the retina and most of them in both. These were late changes, as the earliest case had had the acute attack one year before death, and the others were apparently much later. During life, the acute attack was diagnosed only in two of them,

so it is apparently missed in many cases.

The important findings were partial optic-nerve atrophy and extension of this to the nerve-fiber layer and the ganglion cells, especially at the macula. The optic-nerve atrophy was irregular with a predominance of atrophy in the papillomacular bundle, but was by no means confined to it. The discs showed the changes of secondary optic atrophy with gliosis and sclerosis of the vessels. The macula showed a striking atrophy of the ganglion-cell layer.

One patient with encephalomyelitis had attacks of bilateral optic neuritis three months before her death after which the eyes were obtained. They showed atrophy of the nerve and the ganglion-cell layer at the macula similar to the cases of multiple sclerosis.

Optic neuritis: Visual field defects

Dr. Max Chamlin said that the visual field changes most frequently described in optic neuritis are those of a caecocentral scotoma confined to the central field and involving fixation, with loss of central visual acuity. This applies to papillitis as well as retrobulbar neuritis. However, paracentral scotomas, with sparing of fixation and central visual acuity, as well as the more peripheral types of field involvement are described as rather rare.

Dr. Chamlin described 89 consecutive cases in 59 patients (that is to say, 89 eyes, 59 patients) that he was able to examine in his office and at the hospitals. Only those cases were chosen in which optic neuritis had been established as a definite clinical diagnosis. Brain tumor and toxic amblyopia were carefully ruled out. The following conclusions were reached:

In only 54 percent of the cases there was a discrete caecocentral scotoma without any involvement of the periphery. In an additional 13 percent of the cases, in addition to caecocentral involvement, there was a break-through to the periphery, in most cases the lower nasal periphery being involved. In 18 percent of the cases there was a paracentral scotoma with sparing of fixation and no break-through to the periphery. In 11 percent of the cases there was a paracentral scotoma with sparing of fixation, but with a break-through to the periphery.

Thus, in 32 percent of the cases the fixation area was spared so that central visual acuity was either 20/20 or very close to it. Of all the 89 eyes examined, 27 percent showed defects that reached through to the periphery. However, it must be pointed out that some of these cases were examined long after the initial attack was over, thus showing the recovery stage. The statistics, therefore, represent the findings in various stages of the disease.

The conclusions are that paracentral scotomas with sparing of fixation are not rare, but may be expected, according to this series, in as many as 32 percent of the cases. Furthermore, involvement of the periphery may be expected in 27 percent of the cases of optic neuritis, which again would make it not a rare occurrence.

A further observation was made that none of the central scotomas of optic neuritis start off initially, or in their full-blown picture, as discrete, small, central scotomas without any connection to the blindspot; it is either a residuum in a postneuritic state, or, if found as an initial lesion without caecocentral connection, must be considered very suggestive of a small lesion in the macula, such as central angiospastic retinopathy, rather than optic neuritis.

Optic neuritis: Clinical aspects

Dr. Abraham Schlossman and Dr. Carleton Phillips said that, among 72 cases of optic neuritis at Montefiore Hospital, 83 percent had retrobulbar neuritis. Of the patients with optic neuritis, 69 percent had multiple sclerosis. In private practice, among 42 patients, 62 percent had retrobulbar neuritis and only 17 percent of the cases with optic neuritis showed other signs of multiple sclerosis. The discrepancy in the figures from a chronic disease hospital and

those from private practice is due to the fact that, in private practice, one is more apt to see the initial attack of optic neuritis before multiple sclerosis is fully developed and diagnosed. A chronic disease hospital, on the other hand, collects advanced cases and treats them.

A visual disturbance was the initial lesion in 17 out of 57 cases with multiple sclerosis. In 19 patients the first acute attack of optic neuritis occurred after a diagnosis of multiple sclerosis had previously been established by other means. Seven patients gave a history of gradual loss of vision and 10 who showed clinical or autopsy evidence of optic atrophy gave no history of visual disturbance. Many of these patients retained vision of 20/30 or better. It is possible that many of these patients had acute attacks which were unnoticed because they did not involve the fixation areas.

There were 10 patients who had recurrences. It is very likely that many recurrences are missed. This may be due to the fact that the patients are too ill to complain about visual disturbance or that the central vision is spared in some of the attacks.

Among the 57 patients with multiple sclerosis, seven cases had edema of the nervehead. The infrequency with which edema of the papilla is noted is in sharp contrast to the relatively greater frequency with which secondary atrophy is observed. In many acute cases, the edema may be so slight and last for such a short time that it is missed.

After an acute attack, the vision may not necessarily improve to 20/20 but it will usually be better than 20/50. Even when the eye regains 20/20 vision, some tell-tale evidence, such as a paracentral scotoma or a partial nerve-fiber bundle defect, usually remains. If the area of greatest improvement happens to include the fixation point, the vision may even return to 20/20. However, the surrounding area may similarly show varying degrees of improvement while the fixation area remains unchanged. When the attacks are bilateral, the improvement in each eye is usually dissimilar.

The cases which were examined at autopsy were discussed. In general, the pathologic involvement is much more extensive than one would expect from the clinical findings. One patient, who suffered from bilateral retrobulbar neuritis two years before her death, had 20/30 vision in each eye shortly before death. Pathologic sections of her eyes revealed extensive atrophy and demyelination of both optic nerves.

In multiple sclerosis, the primary lesions are in the myelin sheaths and the cellular infiltration and connective tissue reaction follow later. The term "optic neuritis" implies an inflammatory process which may not necessarily be present in the disease. For this reason it was suggested that the term "optic neuropathy of multiple sclerosis" would be more in line with the demyelinating and degenerative character of multiple sclerosis.

Discussion. Dr. Alfred Kestenbaum said that, for any statistics in this matter, it would be important to separate intrabulbar neuritis (swelling below 2.0D., only few hemorrhages, only slight engorgement) from retrobulbar neuritis (either completely normal fundus or the picture of papilledema, such as swelling of more than 2.0D., many hemorrhages, severe engorgement).

The two diseases are different in many points of view: intrabulbar neuritis shows peripheral sector-shaped field defects; retrobulbar neuritis shows a central scotoma; the former starts gradually, the latter suddenly; the former results in secondary atrophy, the latter in temporal pallor.

In retrobulbar neuritis the central or paracentral scotoma is the most conspicuous defect but not the only one. In almost every case of retrobulbar neuritis with a definite central scotoma, the visual acuity is depressed within the entire field. The peripheral vision can easily be tested by "finger counting" at different places in the visual field. In cases of retrobulbar neuritis with central scotoma, the vision at a 25-degree

distance from the center is finger counting at perhaps 25 cm. Normally, at a point 25 degrees from the center, the visual acuity is finger counting in one meter or a little more. This striking depression of vision in the entire field can be found in most of the cases of severe retrobulbar neuritis.

Bernard Kronenberg,
Recording Secretary.

COLLEGE OF PHYSICIANS OF PHILADELPHIA

Section on Ophthalmology

January 15, 1953

Dr. George F. J. Kelly, *chairman*

Open-angle glaucoma

Dr. W. Morton Grant, guest speaker, and Dr. Robert R. Trotter correlated their own investigations with those of others. The term "open-angle glaucoma" is preferred to the older "chronic simple glaucoma" as being more specific and descriptive. The preferred name emphasizes a fundamental difference from "angle-closure glaucoma," on which there is good agreement among the works of Scheie, Haas, Chandler, and the present authors.

In open-angle glaucoma, the angle of the anterior chamber remains open at all times, although the width of the angle varies in different individuals from wide to narrow.

As in other glaucomas, there is in open-angle glaucoma an abnormally great resistance to the outflow of aqueous humor. In open-angle glaucoma the resistance characteristically remains abnormal during spontaneous fluctuations of intraocular pressure even into the normal pressure range. This contrasts with the behavior found in angle-closure glaucoma, where abnormal resistance is present only during episodic attacks of obstruction of the trabecular drain by the iris, or during chronic closure by peripheral anterior synechias.

An abnormality of resistance to outflow has long been recognized as a characteristic of glaucoma, and has formed a basis for several diagnostic tests, such as the water-drinking and compression tests. A test employed by Kronfeld, utilizing compression and pressure measurement with a Schiøtz tonometer, was one of the forerunners of a test by Moses and Bruno and of a current method ("tonography") of the speakers. In the latter an electronic tonometer and recording galvanometer are employed to measure the fall of pressure which occurs while the tonometer is allowed to rest on a patient's cornea.

A plot of the initial tonometer scale reading and the reading after four minutes of tonometer application for a large group of normal and for a group of definitely glaucomatous eyes shows that the two groups fall in separate areas of the plot with only moderate overlap. It appears that on this basis eyes with open-angle glaucoma can be fairly well distinguished from normal eyes, even at a time when the pressure itself is within the normal range. (These findings do not, of course, apply in angle-closure glaucoma, glaucoma secondary to inflammation, or in glaucomatocyclitic crises at times when the pressure is normal.)

This method of measurement has some clinical usefulness in the detection and diagnosis of glaucoma when employed as a qualitative test like that of Kronfeld. However, only through mathematical analysis of the measurements does it provide an answer to whether the abnormal resistance in glaucoma is a minor, inconsequential characteristic of the disease or whether it is the major abnormality. Such an analysis is based on Friedenwald's data for pressure and volume relationships and on the speaker's new and independent data and indicates that abnormal resistance to outflow, rather than an abnormality of rate of aqueous formation, is the principal reason for the elevation of intraocular pressure.

The cause for obstruction to outflow is apparent in angle-closure glaucoma as well

as in the open-angle glaucomas with abnormal material visible in the trabeculum, such as in glaucoma capsulare and pigmentary glaucoma. However, in primary open-angle glaucoma when no abnormality is visible in the angle, it seems that the impediment to outflow must be explained by abnormality of the aqueous-outflow channels themselves or by elevated venous back-pressure in the recipient vessels. The evidence is principally in favor of an abnormality of the outflow channels.

The same kind of tonographic finding of resistance is obtained in primary open-angle glaucoma as in the glaucomas due to obvious mechanical obstruction. In some of these other glaucomas the resistance is found to persist postenucleation, with venous back-pressure at zero.

In the case of intraocular pressure elevated in association with increased venous pressure, such as is found in patients with arteriovenous fistula, the tonographic measurements differ from those of primary open-angle glaucoma and do not indicate abnormal resistance to outflow. Increase in venous back-pressure and increase in intraocular pressure are essentially equal in amount. This has been shown by Weekers in a case of arteriovenous fistula and is also true in measurements on enucleated normal eyes when the back-pressure has been varied experimentally.

In glaucomatous eyes with elevated intraocular pressure no comparable rise in venous pressure has generally been found by those who have made measurements on recipient vessels in patients.

Dr. Grant and Dr. Trotter conclude that abnormality of the outflow channels themselves is responsible for the increased resistance to outflow in glaucoma, and it is the nature of this abnormality which is now being most actively investigated.

The site of abnormality has not been determined. However, there is evidence that very little of the resistance to outflow in normal eyes is associated with structures in the conjunctiva, episclera, or outer half of the sclera, for these structures may be dissected away without altering the outflow resistance in enucleated normal human eyes. The outflow resistance in these eyes is essentially the same as that found by tonography in normal eyes of patients.

Treatment is now principally directed toward improving the facility of aqueous outflow, either by drug or surgical means. It is possible that, as a better understanding of the cause of obstruction to outflow is developed, more effective measures may become apparent.

M. Luther Kauffman,
Clerk.

Ophthalmic Miniature

The Esquimaux, inhabiting Hudson's Bay, are well aware of the loss of vision which arises from constantly viewing a country covered with snow. They make use of a kind of preservers, which they term snow eyes. These consist of two pieces of wood or ivory, so formed as to fit the eyes, which they completely cover, and are fastened behind the head. Each piece presents a narrow slit, through which everything is distinctly seen. This invention preserves them from snow blindness.

William MacKenzie,
Diseases of the Eye, 1830.

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PISCES VOBISCUM

Not far away from my island fishing camp in Canada where I spend the summers is a place called Isle d'Oeil, or "Easily Oiled" as the natives say. It belongs to a promotor chap named Salop. He passes, according to himself, as an expert on all sorts of things, particularly marine life and chemistry. It seems that at one time or other this character had either edited, annotated, embellished, or written a learned foreword to a book called *Twenty Thousand Leagues Under The Sea.* Or at least he was always planning to do this. Whether he ever got around to it or not, I do not know. As for chemistry, he made his own gin, and, judging from his appearance and behavior, he must have consumed a lot of it, during Prohibition and since. Everyone knows that the manufacture of gin requires a practical knowledge of

chemistry. At any rate, I can certify that he is an expert on the alcohols, which I recall, along with the Benzine Ring, make up most of organic chemistry. So I naturally turned to him for help in solving a serious piscatorial problem that deeply concerned me.

There is a quiet pool, surrounded for the most part by lovely pines and granite boulders, quite nearby. It is the favorite spot for bass and it has been a peculiar habit of mine to slip into this pool quietly in my canoe and catch a few for the frying pan. Early this summer I went over there to try my luck. After a number of hours of hard work, that is to say hard from a fishing viewpoint, I did not get a nibble. This puzzled me, for I could clearly see at least 20, three-or-four-pounders lazily flapping their fins. I tirelessly tried my elaborate and expensive repertoire of bait, both live and artificial, dangling it in front of their various noses with appropriately enticing jiggles and succulent erotic motions. All in vain.

Just when I was about to give up, I remembered having read of a maneuver, hilariously known as "tickling," described by various literary British piscators. Having had some first-hand knowledge of the veracity of that race of fishermen, particularly the Scot, I was afraid that the report might have been exaggerated. However, the simple operation seemed to be worth a trial. I carefully leaned over the edge of the canoe, quietly slipped my hand and arm into the water and very slowly reached under a fine large bass who appeared to be fast asleep. At the risk of upsetting the balance of nature in producing, by biogenic stimulation (Feeletov) a premature spawnation, I wriggled my forefinger back and forth. When he was completely relaxed by this titillation, I suddenly grasped him through the gills and flopped him into the canoe. I am sure that you won't believe this; I wouldn't have either.

When we had both recovered from our surprise, I began to look him over. He was a dandy specimen of his kind, except for the fact that he was blind with cataracts. Presumably all of these reluctant fish had cataracts. This was a much more complicated problem than a purely personal one. It concerned social security and the Welfare State. It needed immediate action, for as soon as the bureaucrats in Washington heard of this, they would at once set up a special task force, call it "Operation Fish Lens" and overstaff it with broken-down politicians, do-gooders and left-wingers. Our exorbitant taxes would go up another notch and all sorts of rules, regulations, and forms would be made to protect the poor fish from predatory exploitation by us White Collars.

In my distress, I turned to Salop, whom I found deeply immersed in his own special brand of chemistry. He was alert enough, however, to size up the problem and to grasp the possibilities.

"It is well known," he said, "that humans and fish have much in common. It is also a fact that the proteins of lenses are organ, and not species, specific, albeit not soluble in alcohol, I regret to say. It follows, therefore, that the feeding of human lens material to these fish should absorb their cataracts."

I was suitably impressed with this brilliant reasoning and he went on to say:

"All we have to do, therefore, is to ask our colleagues, especially the Ophthalmic Residents, to send us the cataracts that they are removing in masses and at great expense (to the patient, that is) all over the country."

Once we obtained these lenses, the rest would be quite simple, according to Salop. So I sent out a batch of telegrams to my colleagues, friendly and otherwise, and in a few days barrels and buckets filled with undressed cataracts, just in their incipiency, arrived by plane, boat, and rail.

The dressing of the lenses, that is to say the separation of the vitreous still clinging to them, turned out to be a formidable task. For the benefit of those many authors of statistical reviews of their own cataract surgery who have obviously never seen vitreous, let me say here that it is a transparent, thickly

viscous material, extremely slippery when stepped upon.

Soon the rock upon which we were working was covered with a thick layer of this tenacious stuff. This proved to be a dangerous carpet, especially for Salop with his habitual unsteadiness of gait, so I tied him to a pine tree and left him beating time with a gin bottle to this lyric of his own composing. Appropriately, the tune is "My Maryland" ("Tannenbaum"), for he had once done some investigation in a famous eye lab there, or so, he said.

EHEU

Poor old fish who cannot see,
How so sad I am for thee!
How wise of you to come to me,
For soon you'll see, I guarantee.*
Here is, for you, some fish lens fare,
And short, I'm sure, you'll be aware
Of all there be, that interests thee
On land, in air, or on the sea.

I spread the dressed cataracts out upon a smooth rock, in even rows, and in a short time the fumes of alcohol and the heat of the sun had permeated the permeability of the capsules so that dehydration, which is a chemical action, quickly took over. They were easily crushed with a lawn roller and produced a fine glistening powder, not unlike mica. All of the lens proteins, from alpha to omega, lay exposed to view and could be readily identified. They formed a scintillating picture. Their pH was 6.7, the s.g. 1.002, but the isoelectric point and other scientific data, I regret to say, were lost because while I was dictating the protocol to Salop, he fell soundly asleep.

After the powdery material was dried sufficiently, we put it in buckets covered with mosquito netting to keep it sterile. Each day, for several weeks, we dumped several hundred grams of the stuff, which looked very much like fish food, into the pool of the blind fish. We could watch them happily chomping on the flakes, drifting down upon their noses.

* Alternate line—'Twill cost a pretty fee, you'll see. (Editor.)

At this point in our scientific experiment, Salop disappeared for a few days and on his return he told me that, convinced of the positive success of the experiment and its commercial possibilities, he had formed a corporation, called the Corkedtight Cataract Asylum, and had already sold several thousands of shares mostly to Fisheries. I think the reason why these people bought in was to insure the escape of more fish from their nets. Blind fish are easily netted. The fewer fish netted the greater is the scarcity and therefore the higher the price. I strongly suspect, too, that the Government would later subsidize this venture for the philosophy of scarcity is firmly established (vide par. 4 above).

Salop also showed me the latest copy of TIBE, a well-known weekly news review, which is, I think, the house organ of some soap manufacturer or other. In a prominent place, under Medicine, was a characteristically written article describing Salop's discovery and generously giving a footnote supplying his office address and hours of business. The choice of this periodical in which to announce to the world this stupendous piece of news was a very wise one, for every one knows that he has only to read TIBE, and nothing else, in order to get the latest scientific information.

I daily visited the pool, testing the outcome of the experiment by casting lures in front of our fish, with negative results, and I began to suspect that something was not quite right.† Not so Salop who was ecstatically busy answering hundreds of letters,

† Certain rival editors will, no doubt, severely criticize the acceptance of the above contribution on the ground that neither the experiment nor Salop was properly controlled. I am sure that our readers will agree on these and other grounds as well. It seems fair, however, to point out that a lot of this human lens substance must have been eaten by many other and younger fish as well. The fact that a number of these were later caught by Bartisch and that *None* of them had cataracts seems to be convincing proof that this material prevents the formation of cataracts. (Editor.)

shipping out cartons of powdered lenses and banking the returns.

Toward the end of the summer I was completely convinced that the stuff wouldn't work, but said nothing about it, realizing the futility of going against the great authority of TIBE. I resolved, however, to return to the task next summer. Only this time, I would replace the cataracts with acrylic lenses. In the matrix of these artificial lenses I purpose to insert some radioactive isotope, P^{188}. Then all I shall need to find and catch my fish will be a special lure containing a small Geiger counter. The clicking noise will not only attract the fish but also the P^{188}. You will surely hear about this later in either TIBE or LICENSE, the journal of the A.A.A. of L.

Georg Bartisch, 2nd.

XVII INTERNATIONAL CONGRESS OF OPHTHALMOLOGY

Montreal, Canada—September 10 and 11, 1954

New York City—September 13 through 17, 1954

Subjects for discussion: *Glaucoma* and *Uveitis*

CORRESPONDENCE

Surgical correction of myopia

Editor,
American Journal of Ophthalmology:

The total or partial correction of myopia by surgically flattening the cornea as described by Dr. Sato et al. in your issue of June, 1953, is certainly a very radical procedure. But what prompts this letter is to inquire whether or not the authors have tried incisions on the anterior surface of the cornea only in order to achieve their results.

The posterior surface of the cornea, or rather the anterior surface of the aqueous, acts like a concave refracting surface because the index of refraction of the aqueous is lower than that of the cornea. This gives the power of the posterior surface of the cornea about minus four to five diopters. The effect of peripheral incisions, as the authors say, is to increase the curvature of the periphery and decrease the curvature of the central pupillary area. On the posterior surface, this would have the effect of decreasing its minus power and therefore increasing the total power or the myopia of the eye.

It would therefore seem that only incisions on the anterior surface of the cornea in man would be effective in correcting myopia. This would make the procedure much simpler and safer.

The posterior surface of the cornea, at best, can have only a slight effect, since the difference in index between cornea and aqueous is so slight. But possibly peripheral incisions on the posterior surface parallel with the limbus would cause, by the cicatrical shrinking of the peripheral portion, increase in the curvature of the central pupillary area, thereby increasing the minus power of the posterior surface and help to correct the myopia. But this also would have relatively little effect.

Such procedures should be investigated. But especially to be noted is the possibility that the authors' incisions on the posterior surface hindered, rather than helped, the correction of the myopia.

(Signed) Joseph I. Pascal,
New York.

Dr. Sato's reply

Editor,
American Journal of Ophthalmology:

I wish to express my appreciation of Dr. Pascal's interest in our recent article as well as for the opportunity to reply through the American Journal of Ophthalmology.

First I should like to ask Dr. Pascal whether he has or has not tried incisions on the anterior surface of the cornea only and whether he has or has not tried incisions parallel with the limbus and then discuss whether the posterior incisions increase myopia rather than decrease it.

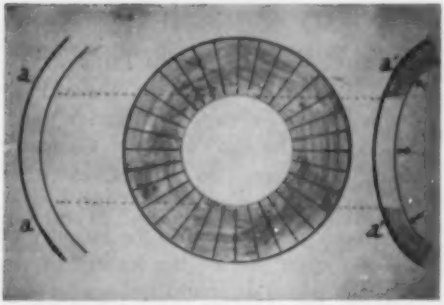


Fig. 1-A (Sato). Diagram of technique.

Before going into details, however, I should like to make clear that incisions of the anterior corneal layers do not signify that the anterior surface only will be altered any more than posterior incisions will affect only the posterior corneal surface. When incisions are made on both sides of the cornea, as indicated in my method for reduction of myopia, the entire corneal structure will be changed in form as in Figures 1-A and B, and flattening of the pupillary zone will be obtained.

As shown in Figure 2, I have made anterior half-corneal incisions in many different ways on rabbit eyes for no other purpose than to gain experience. Even removal of the anterior half of the cornea was attempted, as shown in Figure 3. No favorable effect was obtained by the method illustrated in Figure 3-A and the procedure illustrated in Figure 3-B resulted in marked peripheral pannus and turbidity of the pupillary zone.

It is well known that, when ophthalmologists treat injuries to the anterior half of the cornea, many of these cases heal without

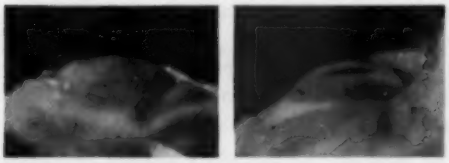


Fig. 1-B (Sato). (Right) A rabbit eye two months after the posteroanterior half-corneal incision, showing 16.0D. hypermetropia. (Left) Control eye of same rabbit.

Fig. 2 (Sato). Various types of anterior incisions.

change of refractive error. On the contrary, injuries to the posterior half of the cornea, combined with rupture of Descemet's membrane, leave marked refractive error. In the event of severe injury to the anterior surface, thermal or chemical burns of the cornea and so forth, sufficient to cause extensive leukomas, the posterior layer of the cornea is injured and thus the corneal curvature is altered.

The histologic differences in healing between the anterior and posterior corneal layers is well known. Whereas, the wounds of Bowman's membrane heal edge to edge, incised edges of Descemet's membrane curl away from each other and the two edges never unite. The differences in effect of anterior and of posterior half-corneal incisions are based fundamentally on the peculiar differences in wound healing of these two areas, and it is seen that the anterior incisions serve only to enhance the refractive effect of the posterior incisions.

I have attempted posterior incisions parallel to the limbus on the animal cornea in many ways as indicated in Figure 4. None of these has proved satisfactory since the effects obtained were unstable and myopia was actually produced in the majority of

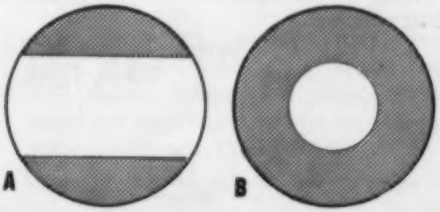


Fig. 3 (Sato). Removal of anterior layer. (A) No favorable effect was obtained by this method. (B) This resulted in marked peripheral pannus and turbidity of the pupillary zone.

Fig. 4 (Sato). Posterior half-corneal incisions parallel to the limbus.

cases. This is probably because of an increase in curvature of not only the posterior corneal surface but the anterior as well. Incisions of this kind have the following drawback:

If they are confined to only one part of the posterior corneal surface, as for cases of astigmatism, they are quite harmless, but if the incisions are made completely around the pupil, as shown in Figure 4, they usually cause marked turbidity in the pupillary zone and peripheral pannus.

In conclusion, posterior incisions parallel to the limbus are not suitable for surgical modification of myopia.

It is believed that the above answers will satisfy Dr. Pascal that there is no danger of increasing myopia through posterior incisions of radiant type. I concede that there is much room for improvement in my surgery for myopia and, as a matter of fact, the technique has been changed and improved since the original manuscript was submitted for publication. At present the insertions of the corneal knife on the limbus are made on six points instead of the four.

It is my intention to attend the International Congress of Ophthalmology in New York in 1954, where I hope to have the good fortune of meeting Dr. Pascal and to have a chat with him.

(Signed) Tutomu Sato,
Tokyo, Japan.

BOOK REVIEWS

GLAUCOMA: PATHOLOGY AND THERAPY. By Paul Weinstein, M.D. (Translated by Julius Foldes, Foreword by Derrick Vail.) St. Louis, The C. V. Mosby Company, 1953. 295 pages, 36 figures, extensive bibliographies, index. Price: $8.00.

This book is dedicated to the memory of Emil de Grósz, one of the leaders of the Hungarian school of ophthalmology between 1920 and 1940 and the author's principal teacher. A good portion of the work on which the book is based originated at de Grósz' clinic in Budapest. The author, very early in his professional life, chose glaucoma for a cause and has remained faithful to it, despite the hardships that came with the last war and the many upheavals in Hungary's social and economic structure. He now holds the positions of associate professor of medical ophthalmology at the University of Budapest and chief of the eye department at the Jewish Hospital in the same city.

Two of the principal aims of the book are obvious: to review the subject objectively and comprehensively and to demonstrate the value and to present some of the results of the hemodynamic approach to glaucoma problems.

The comprehensiveness is borne out by the size of the bibliographies which make up approximately 40 percent of the book.

The hemodynamic approach pervades the entire book but is most apparent in the chapters dealing with the physiology of ocular tension and the etiology of glaucoma. The principal methods used in the study of the hemodynamics in the various glaucomas are dynamometry, oscillometry, and capillaroscopy.

The author conceives the attacks of acute, congestive glaucoma as being due to an acute capillary dilatation, occurring in vasoneurotic individuals with well-responding blood vessels. "More blood enters the eye than is able to leave during a unit of time and the globe hardens." Eighty percent of the cases

of acute congestive glaucoma occur in hypertensive women during menopause. The positive response of this form of glaucoma to the darkroom test is interpreted as the result of an ocular-diencephalic reflex and not of chamber angle closure.

In the mechanism of simple glaucoma, sclerosis of the outflow channels plays a decisive part but increase of the ocular tension is only one of the factors in the pathomechanism of glaucoma simplex. Just as important is a retinal vascular factor which tends to impair retinal circulation. The author has studied this factor primarily by ophthalmodynamometry. Most favorable from the standpoint of retinal circulation and preservation of vision is a high arterial pressure combined with a low venous retinal pressure. Patients with that pressure constellation stand glaucoma better than patients with low arterial pressure.

In support of these views which are very similar to those held by other prominent workers in the field, the author presents a fair number of measurements and clinical observations which probably add up to what is generally considered suggestive evidence. More measurements under rigidly controlled conditions will be necessary to prove the dependence of the course of the glaucomatous optic nerve disease upon the prevailing vascular pressure gradient in the retina.

Specific mention should be made of the author's work on outflow-channels not connected with the trabeculum-canal of Schlemm system. He believes that the vascular plexus described by Kiss in the anterior and outer portion of the ciliary body (the ciliary plexus) serves the purpose of elimination of the aqueous. Its vessels contain a mixture of aqueous and blood and may emerge from the sclera through anterior emissaria as typical laminated veins.

Another important concept held by the author is that the glaucoma secondary to obstruction of the retinal vein is caused by swelling of the vitreous which is caused by pathologic metabolites diffusing out of the circulatorily embarrassed retina.

The chapter on therapy is comparatively brief, but decidedly helpful and clearly indicative of the author's vast clinical experience and sound judgment. At the very end of the book the author pays a nice compliment to American ophthalmologists by using for a conclusion Derrick Vail's summary of the glaucoma symposium presented before the American Academy of Ophthalmology and Otolaryngology in 1948.

The original manuscript was written in Hungarian and translated into English by a friend of Dr. Weinstein, the pathologist Julius Foldes. In an effort, presumably, to preserve as much as possible the author's individual way of expressing his ideas the American manuscript editor has kept his hands off. The result is a peculiarly uneven style, very vivid and expressive in some places, stilted and ambiguous in others and bordering upon the enigmatic in still other places. A specific stumbling block for the reviewer was the use of the word "gulf" for flow. A book as crammed with factual data as this one could hardly be expected to be easily readable, especially since the author's procedure of treating the enormous material, out of courtesy and respect for other men's opinions, has been more that of enumeration than of integration.

Altogether the book is a valuable, important contribution to the literature which will prove helpful to both the clinician as well as the research worker.

Peter C. Kronfeld.

PHYSIOLOGY OF THE EYE. By Francis Heed Adler, M.D. St. Louis, C. V. Mosby Co., 1953. Second Edition, 734 pages, 329 illustrations including three in color, bibliography, and index. Price: $13.00.

In every field of ophthalmology there is usually one outstanding book and in that of ocular physiology the accolade surely belongs to this fine presentation. The present volume contains 25 more pages and 11 more illustra-

tions than the edition of 1950, but the general format is essentially unchanged. Many chapters have been enriched with interesting new material.

The importance of the limbal vascular plexus in the nutrition of the cornea has been conclusively demonstrated by the use of isotopes. Though the Cogan-Kinsey hypothesis of corneal turgescence is being seriously questioned, it has yet to be replaced with a satisfactory alternative. The recent work on the facility of aqueous outflow is presented. The ascorbic acid level of the blood plasma is the factor determining whether ascorbic acid is actively transferred to the aqueous or diffuses out. The selective permeability of the blood-aqueous barrier is shown to result from the selective affinity of the barrier membranes for lipid soluble substances. For this reason chloramphenicol penetrates the barrier more readily than penicillin. The high cytochrome content of the lens epithelium allows aerobic respiration while the absence of cytochrome in cortex and nucleus necessitates anaerobic metabolism. The Stiles-Crawford effect is elucidated as well as O'Brien's recent plausible explanation of the phenomenon.

Adler's insight in the clinical applications of ocular physiology is brilliantly exemplified in the sections on the pathologic physiology of strabismus which every ophthalmic surgeon should read. In the listing of influences affecting visual acuity, Adler has added lid pressure (a large chalazion should be removed before testing the refraction), fixation, tear film, and winking. The following statement by inference registers disapproval of the projectochart: "From a practical point of view it is important to maintain full light adaptation of the retina during refraction. It is not good practice to refract a patient in a darkened room, even though the level of illumination at the test chart is adequate."

James E. Lebensohn.

BULLETIN OF THE OPHTHALMOLOGICAL SOCIETY OF EGYPT. Volumes 43, 1950; 44, 1951; 45, 1952.

These volumes consist mostly of case reports and studies based, for the most part, on clinical work. The subjects range from plastic surgery of the eyelids to cerebral thrombophlebitis, with a continual interest in trachoma.

In his presidential address (1950) F. Maxwell Lyons states that little progress has been made against trachoma in Egypt, but that Egyptian trachoma seems to be milder today than 50 years ago. Acute bacterial ophthalmia is a much more important problem, and recent controlled studies show that regularly recurring epidemics of Koch-Weeks bacillus and gonococcal infections can be controlled either by reduction of carrier reservoirs by mass chemotherapy or by fly control.

In the same volume is an interesting symposium on sympathetic ophthalmia, and papers indicating a swing from the trephining operation to iridencleisis for glaucoma.

The 1952 volume contains a fine symposium on antibiotics in ophthalmology including an excellent discussion of the problem of trachoma by Sabri Kamel. Kamel, Mitsui, and others tend to rate terramycin, aureomycin, and chloramphenicol in that order of usefulness.

A brief paper by M. A. H. Attiah and A. Mortada (1952) shows the results of repeated subconjunctival placental grafts in various degenerative conditions to be inconclusive or nil in their 100 cases.

The reviewer found the reports to be of high caliber and, in general, delightfully brief.

Robert A. Moses.

ABSTRACT DEPARTMENT

EDITED BY DR. F. HERBERT HAESSLER

Abstracts are classified under the divisions listed below. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. Anatomy, embryology, and comparative ophthalmology
2. General pathology, bacteriology, immunology
3. Vegetative physiology, biochemistry, pharmacology, toxicology
4. Physiologic optics, refraction, color vision
5. Diagnosis and therapy
6. Ocular motility
7. Conjunctiva, cornea, sclera
8. Uvea, sympathetic disease, aqueous
9. Glaucoma and ocular tension
10. Crystalline lens
11. Retina and vitreous
12. Optic nerve and chiasm
13. Neuro-ophthalmology
14. Eyeball, orbit, sinuses
15. Eyelids, lacrimal apparatus
16. Tumors
17. Injuries
18. Systemic disease and parasites
19. Congenital deformities, heredity
20. Hygiene, sociology, education, and history

5

DIAGNOSIS AND THERAPY

McCoy, Carroll A. **New type of tubing for use with the erysiphake.** A.M. Arch. Ophth. **50**:356, Sept., 1953.

The use of light weight vinyl tubing makes possible closer, more exact handling of the erysiphake cup. (1 figure)

G. S. Tyner.

Moskowitz, H. L. **Gonioscopy in foreign bodies of the chamber angle.** A.M.A. Arch. Ophth. **50**:319-322, Sept., 1953.

Two cases are reported in which the usefulness of gonioscopy was demonstrated in diagnosing foreign bodies in the anterior chamber. The foreign material was so situated in the angle that it could not be made visible by other means. (2 figures) G. S. Tyner.

Pollak, L. W., Werner, L. E., and MacDougald, J. **The problem of tonometric standardization.** Tr. Ophth. Soc. U. Kingdom **72**:241-252, 1952.

A modified membrane manometer similar to the water-filled membrane manometer as suggested by Schiøtz was constructed for standardization of the tonometer. (9 figures)

Beulah Cushman.

Rosner, Robert S. **Lens refraction tree.** A.M. Arch. Ophth. **50**:357, Sept., 1953.

A lens refraction tree is introduced with a cross cylinder at its top. (1 figure)

G. S. Tyner.

Schreck, E. **An instrument for perforating keratoplasty.** Klin. Monatsbl. f. Augenh. **123**:363-365, 1953.

This instrument facilitates the corneal trephine application by constantly filling the anterior chamber through a separate small canalicula introduced at the limbus. (1 figure) Frederick C. Blodi.

Vannas, M., Sallinen, I., and Sysi, R. **X-ray therapy of ocular diseases.** Klin. Monatsbl. f. Augenh. **123**:324-331, 1953.

This report is based on 133 patients treated in Finland. Good results were obtained in sclerokeratitis (38 cases) and iridocyclitis (43 cases). In chorio-retinitis (20 cases) the results were encouraging. Out of 12 cases of retinal periphlebitis only five showed some improvement after

the treatment. Nine patients developed a cataract. The patients received a series of four treatments of 50 to 100 r each. A 3-mm. aluminum filter was used and the skin-target distance was 40 cm. The kw is not given. (14 references)

Frederick C. Blodi.

Weinstein, P. **The ophthalmological diagnosis of pituitary tumors.** Ophthalmologica **125**:169-171, March, 1953.

Several cases are cited to illustrate the fact that the ophthalmoscopic and perimetric findings (the latter obtained by ordinary methods) may be normal in the presence of a retrochiasmal tumor. Perimetry with small (1/2000) targets as recommended by Chamlin (Arch. Ophth. 44:53, 1950) may show characteristic field defects where the isopter for 3/300 has been normal. (2 references)

Peter C. Kronfeld.

Wolff, R. **A disc-knife for plastic operations.** Klin. Monatsbl. f. Augenh. **123**:362, 1953.

A round, solid disc is rotated by an electric motor. This should facilitate incisions in the skin of the lids. (1 figure)

Frederick C. Blodi.

Woods, Alan C. **The value of cortisone and ACTH in ocular diseases.** Tr. Ophth. Soc. U. Kingdom **72**:171-189, 1952.

The author reviewed the range and limitations of ACTH in ophthalmology. The parenteral administration of ACTH or topical administration of cortisone was followed by a dramatic control of the inflammatory and exudate phases of the disease in a high percentage of cases, with a tendency for the inflammation to recur after cessation of treatment. But in degenerative diseases, whether of the cornea, retina or uveal tract, these agents were totally without effect. In external ocular diseases produced by allergens, toxins, irritants or physical trauma treatment with ACTH or cortisone gives dramatic results in 80 to 90 percent of the cases. In bacterial infections the treatment limited the inflammation and exudation and gave only temporary symptomatic relief. ACTH or cortisone gave spectacular results in non-granulomatous uveitis due to allergy, toxins or physical trauma. There appeared to be decidedly less response to hormonal therapy in granulomatous uveitis. Its use is contraindicated in tuberculous uveitis.

The effect of ACTH or cortisone in experimental ocular diseases is to inhibit the inflammatory response of the eye to various insults such as those produced by protein antigens, bacterial antigens, toxins and irritants. The degrees of suppression depend on the amount of the hormone administered and the severity of the insult. Cortisone exerted a marked inhibitory effect on cellular exudation, inhibited fibrosis, and impaired endothelial regeneration and neo-vascularization. The mechanism of the therapeutic action of ACTH and cortisone in ocular diseases is undetermined but it is probable that there is a direct action of the adrenocortical hormones on the mesenchymal fraction of the inflammed tissue.

Beulah Cushman.

6

OCULAR MOTILITY

Focosi, M., and Muscas, M. **The vertical component in horizontal squint.** Boll. d'ocul. **32**:513-530, Sept., 1953.

Out of 100 patients with horizontal tropias 53 showed a measurable vertical component. Esotropia was present in 46 and exotropia in seven. The examinations consisted of refraction in cycloplegia, measurement of visual acuity, retinal correspondence test by after-images, defining the angle of deviation by corneal mirror images, on the perimeter, or by cover test or with synoptophore, for near and for distance, and in different directions of

gaze. Fifty-five percent of all subjects with convergent squint and 35 percent of all those with divergence had a vertical deviation as well. Anomalous retinal correspondence was found in over 42 percent of all patients with squint examined and in over 46 percent of those with vertical deviation. In more than 48 percent the vertical deviation was due to overaction of the inferior oblique muscle. In four of these patients a paralysis of the upper oblique was the cause. To obtain good functional and cosmetic results surgery is imperative and was performed in all cases showing a marked vertical deviation. (4 figures, 43 references)

K. W. Ascher.

Giardini, A., and Rizzo, P. **Effect of forced position on the residual angle of deviation after strabismus operations.** Boll. d'ocul. **32**:449-462, Aug., 1953.

A cataract mask modified to permit the eyes to look through a narrow slit in only one well defined position (photographs) was applied to one group of strabismus patients 24 hours after surgery while the control group was bandaged in the usual way. The angle of deviation was measured with the synoptophore and with the screen and prism test one week after operation, a few days after discontinuation of the forced eye position, two weeks after surgery and some months later (4 tables). Among patients who underwent recession, in the group treated with the mask, the angle of deviation remained unchanged or diminished in 26 and increased in 10 persons; without the mask, only 9 kept or diminished their angle while in 27 the deviation grew worse. After resection operations there were no significant differences between the patients wearing the mask and the control cases. (3 figures, 6 references) K. W. Ascher.

Sroka, K. H. **Miners' nystagmus.** Ophthalmologica **125**:185-190, March, 1953.

The paper is primarily a plea for wider recognition of miners' nystagmus as a professional compensable disease. As physician attached to coal mines first in Upper Silesia and, after the last war, in Russia near the Arctic Sea, the author acquired extensive experience in the field of miners' nystagmus. During his apparently involuntary "employment" in Russia he developed the nystagmus himself. He gives a detailed technical description of the working conditions as they prevailed in Russian coal mines and underground plants concerned with the manufacture of coal products. On the basis of his first hand knowledge of these working conditions he considers the abnormal composition of the underground air (high CH_4,CO_2, and CO content) as the principal factor in the causation of miners' nystagmus. Peter C. Kronfeld.

7

CONJUNCTIVA, CORNEA, SCLERA

Agarwal, L. P. **Tissue therapy in parenchymatous xerosis.** Brit. J. Ophth. **37**: 102-105, Feb., 1953.

Subconjunctival implantations of placenta were done in 25 patients with various grades of parenchymatous xerosis. The method of preparation and description of the procedure and details of three cases are reported. The author had remarkable results, with definite improvement in all and complete cure in many patients. (2 figures, 6 references)

Orwyn H. Ellis.

Corkey, J. A. **Riboflavin in marginal keratitis.** Tr. Ophth. Soc. U. Kingdom **72**: 291-303, 1952.

The author feels that riboflavin plays a special part in the metabolism of the avascular cornea and when it is lacking local asphyxia occurs with death of tissue and the production of toxic substances in the cornea. He presents 22 patients with

a marginal type of keratitis. The patients had been given riboflavin during the previous ten years, although the lesion was probably not due to ariboflavinosis alone but to some malnutrition. A striking proportion of his patients gave a history of arthritis. Beulah Cushman.

Foster, J. Bryan. **Post-operative use of cortisone in ophthalmic surgery.** Tr. Ophth. Soc. Australia **12**:163-169, 1953.

Details are given of the post-operative treatment of corneal grafts. Antihistaminic tablets are given three times daily for 10 days. On the tenth day 200 mg. of cortisone is given by injection and 100 mg. on each of the three succeeding days. Thence cortisone drops 0.5 percent are instilled four hourly. The drops are continued for many weeks. A variety of case histories is presented to amplify the text.
Ronald Lowe.

Hobbs, H. E. **Scleromalacia perforans treated with cortisone.** Tr. Ophth. Soc. U. Kingdom **72**:39-48, 1952.

The author refers to van der Hoeve's description in 1934 in which three of the five cases exhibited ocular signs and were associated with rheumatoid arthritis. The characteristic scleral perforations occur without inflammatory signs in middle-aged subjects with polyarticular rheumatism. Klinges (1933) suggested that in rheumatic disease the characteristic changes are due to fibrinoid degeneration of the collagenous tissues of the body which respond as a single organ to noxious stimuli. He describes one case in a patient who responded to treatment with cortisone locally and systemically.
Beulah Cushman.

Langham, Maurice E. **The action of cortisone on the swelling and vascularization of the cornea.** Tr. Ophth. Soc. U. Kingdom **72**:253-260, 1952.

Cortisone has no inhibitory action on capillary endothelial proliferation, but it does inhibit the swelling of the cornea. The apparent inhibition of corneal vascularization by cortisone is due to its direct action on restraining corneal swelling.
Beulah Cushman.

Lepri, G. **Fulminant ocular infections from gram negative bacilli; problems of early diagnosis and appropriate therapy.** Boll. d'ocul. **32**:531-548, Sept., 1953.

Lepri provides an extensive description of three cases of exogenous (traumatic) corneal infection with Pseudomonas aeruginosa in two cases and with Bacillus coli in one. The infections were studied with in vitro tests and animal experiments. The strain isolated from one eye did not respond to the application of penicillin (as expected) and (contrary to expectation) of streptomycin. Terramycin gave moderately good results; neomycin brought rapid healing of the induced infection. The fact that different strains may show different sensitivity to the same antibiotic suggests early cultural diagnosis of the responsible germ and rapid in vitro sensitivity tests. Tables display the results of in vitro studies. (4 figures, 12 references)
K. W. Ascher.

Loschdorfer, J. J. **Report on ophthalmological conditions in Papua and New Guinea.** Rev. Intern. du Trachome **30**:411-417, 1953.

Trachoma is one of the most common diseases in Papua and New Guinea, especially on the coasts, where pannus is almost constant. The most curious fact is that in many cases the trachoma improves without any treatment. Many patients who have never had any significant clinical expression of the disease show scars of sclerocicatricial trachoma.
John C. Locke.

Michaelson, I. C. **Penetrating corneal graft.** Brit. J. Ophth. **37**:562-564, Sept., 1953.

In the experience of the author, despite all conscious attempts to keep the trephine vertical, it was found that the position of the hand holding the trephine determined the meridian of initial penetration of the trephine into the chamber. This fact is worth noting and two circumstances are described in which the fact may be advantageously exploited. When the graft will include an anterior synechia, the incision should be so maneuvered that the adhesion is in the immediate area of the first penetration. This arrangement makes possible easier section of the adhesion and greater protection of the lens. When the trephine cut is to traverse both opaque and clear cornea, the initial penetration should be in the opaque area since the trephine cut tends to heal more quickly than the scissors cut and opaque cornea tends to heal more slowly than clear. Furthermore, the cut made by scissors can be more safely made in clear cornea than in opaque. (2 figures)

Morris Kaplan.

Mitsui, Y. **Trachoma problems.** Acta Soc. Ophth. Japan 57:973-1003, Sept., 1953.

In this lecture presented before the 57th annual meeting of the Japanese Ophthalmology Society the author emphasizes that trachoma starts acutely. The acute stage is easily overlooked when the infection occurs in infants. In infants there is an apparent discontinuity of the clinical course between the acute and the chronic stage. Mitsui considers the inclusion bodies to be the colony of the trachoma virus. Cultivation of trachoma virus in human conjunctival tissue culture is encouraging when the roller tube technique is employed. He emphasizes the epithelial nature of trachoma infection. Lack of immunity is proved by reinfection experiments in man. Sulfonamides, chlortetracyclin, oxytetracyclin, erythromycin and carbomycin are effective against trachoma virus while chloramphenicol has little effect. (14 figures, 8 tables, 117 references) Yukihiko Mitsui.

Moore, M. C. **The treatment of vernal conjunctivitis ("spring catarrh"). A series of cases treated by beta irradiation.** Clin. Rep. Adelaide Child. Hosp. 2:137-140, 1952-3.

Radon applicators were the source of Beta rays except in a few instances where strontium 90 was used. Ten patients were treated with very satisfactory results. Dosage was from 17,000 to 45,000 millicurie-seconds in two to four months. In the first 18 months after exposure no radiation cataract appeared but this time interval is recognized as being too short.

Ronald Lowe.

Mori, N. **Symptomatology of epidemic keratoconjunctivitis.** Acta Soc. Ophth. Japan 57:1264-1275, Oct., 1953.

This is a summary of 17 cases. It is assumed that the incubation period is two to eight days. In infants the lesion appears as a membraneous conjunctivitis and systemic symptoms such as high fever are very often associated with it, as was already proved experimentally by Mitsui (Ibid. 52:75, 1948). In the adult the disease becomes manifest as an acute follicular conjunctivitis. Preauricular adenopathy usually occurs. Family transmission is common in Japan in contrast to Thygeson's experience in the United States (Am. J. Ophth. 32:951, 1949). Monocytes are predominant in the discharge during the period of positive adenopathy but before the development of adenopathy and after its disappearance, polymorphonuclear leucocytes are predominant. Punctate keratitis is seen in about 40 percent of the cases. (4 figures, 1 table, 40 references) Yukihiko Mitsui.

Naccache, R. **Topical use of terramycin ointment in trachoma.** Brit. J. Ophth. 37: 106-108, Feb., 1953.

Patients with trachoma were treated during a period of three months by local application. Terramycin is effective in treatment. It is usually quicker acting than sulfonamides and permits longer treatment, especially in children, pregnant women, and debilitated patients. Surgery may still be indicated when there is deep scarring but should be done only after an extensive trial of terramycin. The results were very encouraging with many cures and improvement in all cases. (2 figures, 3 references) Orwyn H. Ellis.

Orbán, T. **Scleritis progressiva posterior.** Ophthalmologica **125**:112-117, Feb., 1953.

Two cases of this rare disease are reported. Both patients were middle-aged men whose ocular disease was clinically a severe chronic unilateral uveitis leading to blindness. After enucleation the posterior aspect of the eyeball was found covered by granulation tissue. Histologically, a severe chronic infiltrative and hypertrophic posterior uveitis had spread into the sclera, causing thickening of the latter to four to five times its normal thickness. The internists' diagnosis in both cases was chronic rheumatic disease. (2 figures, 6 references)

Peter C. Kronfeld.

Orzalesi, F., and Ciuffo, P. **Corneal tissue changes during storage and their probable effect upon the results of keratoplasty.** Ophthalmologica **125**:21-31, Jan., and 91-111, Feb., 1953.

The newer concepts concerning the mechanism of clouding of the graft after keratoplasty are reviewed in great detail. In extracts from stored animal corneas the authors have found one or several histamine-like substances which upon intracutaneous injection cause increased capillary permeability and leukocytic exudation. The clouding of the graft after keratoplasty is probably an allergic phenomenon. (4 figures, 40 references)

Peter C. Kronfeld.

Pham-Van-Tien and Ngo-Van-Hien. **Trachoma in Viet-Nam.** Rev. Intern. du Trachome **30**:361-373, 1953.

This work contains statistics on the incidence and severity of trachoma in Viet-Nam and suggests a plan of action against the disease. John C. Locke.

Philps, S., and Fincham, E. F. **Corneal graft fixation and its relation to astigmatism.** Tr. Ophth. Soc. U. Kingdom **72**:21-39, 1952.

The authors present a modification of Amsler photokeratoscope for photographically recording the form of the cornea by means of its reflected image. The target is attached to the front of the camera and the photographic lens is directed through a hole in its center. It is indispensable in judging the recess of corneal grafting. The trephine cuts in the donor and recipient cornea must be at right angles to the corneal surface. The donor cornea must at all points connect with the recipient cornea of normal thickness. The donor cornea must be held in position exactly edge to edge with recipient cornea until the two have healed sufficiently to withstand the intraocular pressure. The use of a small splint 12 mm. in diameter, having an 8.5 mm. radius and a thickness of ½ mm., has produced a flat graft, is easy to apply and makes an immediate watertight joint between graft and cornea. By the end of the operation the anterior chamber has reformed. (15 figures)

Beulah Cushman.

Ponce de León, Frederico. **Antibiotics in the treatment of diplobacillar conjunctivitis.** Arch. oftal. Buenos Aires **28**:269-275, June, 1953.

The author strongly advocates the use of streptomycin drops and ointment

against blepharoconjunctival infections due to Moraxella lacunata, and stresses the necessity of supporting clinical data with bacteriological findings before therapy is started. However, he does not mention the fact that polymyxin, terramycin and aureomycin are at least as effective as streptomycin against Morax's diplobacillus; on the other hand, one should say that the ordinary mildness of the disease scarcely seems to warrant the performance of laboratory tests as a routine procedure. A. Urrets-Zavalia, Jr.

Postic, S. **The trachoma problem.** Klin. Monatsbl. f. Augenh. **123**:331-350, 1953.

The author discusses the difficulties in differentiating trachoma from paratrachoma (inclusion conjunctivitis). The inclusion bodies resemble each other and the pathologic changes in the conjunctiva are indistinguishable. Biopsy of skin and orbicularis revealed that trachoma involves the deeper structures early, while paratrachoma remains confined to the conjunctiva. The first virus is therefore a neuro-epitheliotropic one, while the paratrachoma virus is purely epitheliotropic. (10 figures, 106 references)

Frederick C. Blodi.

Samuels, Bernard. **Internal gaping of corneal wounds after injuries and operations.** Tr. Ophth. Soc. U. Kingdom **72**:327-342, 1952.

By means of anatomic studies and clinical examples the author demonstrated the elasticity of Descemet's membrane. When lacerated the edges roll up and curve forward. That the action of Descemet's varies as to the direction of the cut whether oblique or perpendicular was demonstrated with slides from pathologic specimens of recent and old injuries. Posterior traction is seldom strong enough to overcome the outward traction of Descemet's membrane combined with the inward traction of the connective tissue in the wedge. A long incision in Descemet's membrane tends to incomplete closure of the posterior part of the incision. Superficially placed sutures tend to produce gaping of the posterior half of the incision. (15 figures) Beulah Cushman.

Sedan, J. **The tolerance of erythrocin** (erythromycin Abbott) **by the human trachomatous and nontrachomatous conjunctiva.** Rev. Intern. du Trachome **30**:418-421, 1953.

Like Mitsui at Kumamoto, the author has obtained quick results in two cases of acute trachoma in infants, using local erythrocin (erythromycin Abbott). Tolerance seems to be better for erythrocin lactobionate ointment than for pure erythrocin ointment both in trachomatous and nontrachomatous eyes.

John C. Locke.

Strughold, H. **The sensitivity of cornea and conjunctiva of the human eye and the use of contact lenses.** Am. J. Optometry **30**:625-630, Dec., 1953.

The sensitivity of the cornea and conjunctiva of an unspecified number of subjects was tested by means of fine hairs and white linen threads affixed to a rod calibrated in grams per square millimeter of pressure. The lowest threshold was at the center of the cornea (0.2 gm./mm.^{2}) gradually rising toward the limbus (2 gm/mm.^{2}). The only type of sensation found was pain. The tarsal conjunctiva was relatively insensitive. Paul W. Miles.

Swanston, Charles. **Trachoma in the Fiji Islands.** Rev. Intern. du Trachome **30**:374-394, 1953.

Trachoma was introduced to the Fiji Islands by the Hindoos and the Chinese, and is widespread. In 1941, 40 percent of the native soldiers and from 30 to 50 percent of the school children were found to be trachomatous. Contamination always occurs in childhood (very rarely after 13

years of age) and most often through the infected secretions of older people.

John C. Locke.

Wheeler, J. R., and Sinclair, S. R. **Tuberculosis of conjunctiva treated with 1. streptomycin and P.A.S. 2. calciferol.** Tr. Ophth. Soc. U. Kingdom **72**:1-12, 1952.

The authors describe two patients with ulcers of the conjunctiva. The first responded to the use of streptomycin and paraaminosalicylic acid combined with general ultraviolet irradiation. Streptomycin 0.5 gm. twice daily and P.A.S. 12 gm. daily for 30 days were used with no change in the preauricular gland. Resolution of the gland began with the ultraviolet irradiation. In the second patient, 23 years of age, Parinaud's syndrome was suspected. Calciferol forte 50,000 units, one tablet three times a day was given and the conjunctival ulcer was healed in 14 days. The preauricular gland was aspirated and 100 R of radiant energy was given in four weekly treatments to the gland. The great difficulty was in establishing the diagnosis and the response to calciferol was most interesting. (3 figures)

Beulah Cushman.

Yourish, Norman. **Conjunctival tophi associated with gout.** A.M.A. Arch. Ophth. **50**:370-371, Sept., 1953.

Urate deposits were recovered from the bulbar conjunctiva of a patient with gout. Under slitlamp examination in situ they appeared as white crystalline deposits in the interpalpebral area. (1 figure)

G. S. Tyner.

8

UVEA, SYMPATHETIC DISEASE, AQUEOUS

Agg, Z. **The Vogt-Koyanagi syndrome.** Ophthalmologica **125**:43-51, Jan., 1953.

One typical case, followed for three and one-half years, is described in detail. The patient, a 36-year-old man, had had cervical lymphadenitis in childhood and a chronic osteomylitis of a long bone since the age of ten. The first manifestation of uveitis was a fairly acute disseminated chorioretinitis which followed in the wake of an influenza-like systemic disease. Signs of chronic anterior uveitis and poliosis set in later. Under streptomycin therapy the eye disease improved temporarily. A piece of iris removed during an antiglaucomatous operation showed no specific tissue changes. (3 figures, 15 references)

Peter C. Kronfeld.

Arouh, J., Zambrano, J. C., and Lis, M. **Fundus changes in tuberculous meningitis. Report on one hundred observations.** Arch. Oftal. Buenos Aires **28**:245-253, June, 1953.

In 45 out of 100 patients, ophthalmoscopic examination yielded positive results; 4 patients exhibited chorioretinal lesions consisting only of slight pigmentary changes and 41 showed alterations of the optic nervehead, which ranged from papilledema, either active (30 cases) or passive (8 cases), to incomplete (1 case) and complete (2 cases) atrophy. It is to be noted that no patient in this series displayed the well-known picture of isolated or multiple choroidal tubercles. (15 references)

A. Urrets-Zavalia, Jr.

Cosmetatos, G. F. **Congenital heterochromia of the iris and its explanation.** Ann. d'ocul. **186**:344-350, April, 1953.

The author ascribes the origin of congenital heterochromia of the iris to a functional hereditary anomaly of the branches of the ciliary nerve which supply the iris. The exact cause is not known. (1 figure, 17 references)

John C. Locke.

François, Jules. **Electroretinography in cases of uveitis.** Ophthalmologica **125**:137-143, March, 1953.

The electroretinogram of patients with chronic or acute uveitis does not differ

significantly from that of the normal eye. (9 figures) Peter C. Kronfeld.

Fulgosi, Ante. **A case of leiomyoma of the iris.** Ophthalmologica **125**:155-163, March, 1953.

The report concerns a 32-year-old male patient in whose right eye a nonpigmented, visibly growing tumor of the iris filled a good part of the chamber and seemed to originate from or extend into the chamber. A leucosarcoma was suspected and enucleation recommended to which the patient agreed after persistent severe pain set in. Histologic examination revealed a well circumscribed leiomyoma of the iris without any demonstrable extension into the iris root, into the angle or ciliary body. (4 figures, 18 references) Peter C. Kronfeld.

Hilgers, J. H. C. **Behçet's syndrome.** Nederl. Tijdschr. v. Geneesk. **96**:2188, 1952.

The author describes a man, aged 31 years, who had recurrent aphthous stomatitis for ten years. In the last five years these aphthae were combined with or followed by an iridocyclitis, first only in his right eye, afterwards in both, sometimes with hypopyon. In both eyes the visual acuity deteriorated because of retinal damage. The acute phase of the inflammation could be cured by atropine and cortisone. The skin appeared to be hypersensitive. Diagnosis, etiology and prognosis are further discussed. G. H. Jonkers.

9

GLAUCOMA AND OCULAR TENSION

Bohringer, H. R., Meerwein F., and Muller, C. **The psychiatry of primary glaucoma.** Klin. Monatsbl. f. Augenh. **123**: 283-302, 1953.

Of 13 glaucoma patients under 40 years of age who had a careful psychiatric evaluation, 11 were neurotics, 2 were psychopaths, and 1 was a chronic alcoholic. Many of the patients were afraid to be in a dark room. The psychiatric aspect is only one of the aspects of this disease. (65 references) Frederick C. Blodi.

DeLong, S. L., and Scheie, H. G. **Dibenamine.** A.M.A. Arch. Ophth. **50**:289-298, Sept., 1953.

Clinical and experimental studies indicate that parenterally administered dibenamine lowers intraocular pressure by causing a decrease flow of aqueous. G. S. Tyner.

Funder, W., and Rotter, H. **An explanation of the compensation maximum of Kleinert.** Klin. Monatsbl. f. Augenh. **123**: 303-309, 1953.

Kleinert found that in most normal eyes a pressure of 150 gm. will only lead to broadening of the aqueous band in the stratified veins. In most glaucomatous eyes a much lower pressure (always exerted with an ophthalmodynamometer) will lead to a reversal of flow in these veins. This was thought to be a reliable sign for early glaucoma. The authors examined 74 patients. Reversal of flow was rare even in frankly glaucomatous eyes. They found that this phenomenon depends very much on the direction of pressure and the test will more likely be positive if the eye with the attached horizontal muscle and vein is pressed against the orbit. The compensation maximum is therefore not a reliable test. (8 figures, 3 charts, 2 references) Frederick C. Blodi.

Goldmann, Hans. **The function of the trabeculum-canal of Schlemm system in the presence of other outflow channels.** Ophthalmologica **125**:16-21, Jan., 1953.

The outflow channels other than the trabeculum-canal of Schlemm system referred to in this paper were an unintentional filtering bleb after cataract extraction in one case and cyclodialysis clefts

in two cases. Closure of these channels was followed by acute rises of the ocular tension to a much higher level than before the formation of these channels. These rises in tension took place in the presence of gonioscopically open angles. The author's interpretation of these observations is that the formation of new outflow channels causes obliteration of the original channels. Patency of any outflow channel is contingent upon its being used. (7 references) Peter C. Kronfeld.

Kronfeld, P. **Present state of tonography.** J. Michigan M. Soc. **52**:1101, Oct., 1953.

Tonography consists of the measurement of the drop in ocular tension that occurs during and as a result of an external eyeball-indenting force. Tonometers of the Schiøtz type serve both purposes. Recent interest in tonography is due to the appearance on the market of the electronic tenometer of V. Mueller. Its two principal advantages are greater accuracy of readings and easier maintenance on the examinee's cornea. The drop in ocular tension occurring while the tonometer rests on the cornea is due to expulsion of fluid from the eye. There is an accelerated outflow of aqueous during the application of the tonometer. There is the possibility of some diminution in the total blood content of the eye during tonography. Two sets of Friedenwald's measurements have been helpful in evaluating the results of tonography, the data pertaining to the volume of the indentation produced by the plunger and the data pertaining to the rise in intraocular pressure caused by the tonometer. With these data it is possible to express the drop in tension occurring during tonography in terms of cmm. of fluid expressed per mm. of tonometric increase in intraocular pressure. The ratio cubic millimeters of fluid expressed per millimeter of tonometric rise of intraocular pressure has become known as Grant's coefficient of the facility of aqueous outflow.

There can be no doubt as to existence of a principal difference between a representative group of early chronic glaucomas and a representative group of normal eyes, the former characterized by a lower coefficient of outflow than the latter. Tonography is of distinct diagnostic value, but there are certain limitations. Since chronic glaucoma probably develops as a deviation from the normal and since the normal range is wide, a coefficient of outflow of 0.15 may be normal for an eye that never had a higher coefficient; the same coefficient would be classified pathologic if the eye had a higher facility of outflow on previous tests. A low coefficient of outflow characteristic of chronic glaucomas lends support to the impaired outflow theory of chronic glaucomas. Since miotics improve the facility of outflow, one interpretation is the assumption of more efficient outflow conditions created by changes in the vascular pressures in the uvea and thereby also in the deep scleral plexus. Theodore M. Shapira.

Magitot, A. **The optic atrophy of primary glaucoma: neurovascular considerations.** Ann. d'ocul. **186**:385-414, May, 1953.

The author upholds the neurovascular theory. Hypertension and optic atrophy are independent entities, but with a common vascular origin in a pathologic modification of nervous control. Spastic lesions slowly give way to a process of sclerosis which invades the branches of the carotids, those of the anterior cerebral, and the circle of Willis. Anteriorly, the sclerosis overruns the pial membrane and invades the choroid which is similar to the pia mater; posteriorly, it reaches the cochleovestibular apparatus. The cauldron-like depression in the nervehead is the result of sclerosis of the vessels of the

circle of Haller, and besides, is not specific for glaucoma.

Clinical study of the central field defects shows that they are the result of vascular lesions, at first spastic and edematous, later sclerosing and obliterating. None of the scotomata are peculiar to glaucoma, and Bjerrum's scotoma itself may be met in chiasmal lesions, choroiditis, and other eye diseases. As for the peripheral field contraction, its centripetal direction, affecting mainly the nasal side, and its symmetry which leads to a binasal quadrant hemianopia, can only be explained by vascular lesions affecting the intracranial portion of the optic nerve.

The nervous control of ocular tension, the vegetative centers and particularly the vasoregulators lies in the hypothalamus. Glaucomatous mydriasis may be ascribed to a bilateral dysfunction of the pretuberian iris centers. Functional connections with the pituitary gland are inseparable which accounts for the endocrine disturbances of glaucomatous patients. Finally, all glaucomatous subjects are more or less thalamic hypersensitive patients. The coincidence of glaucoma with Cushing's syndrome, retinitis pigmentosa, Sturge-Weber's disease, and angioneurotic edema of the lids is mentioned. The glaucoma of epidemic dropsy is explained as a diencephalic intoxication. (133 references)

John C. Locke.

Miller, S. J. H. **Stellate ganglion block in glaucoma.** Brit. J. Ophth. **37**:70-76, Feb., 1953.

This paper records the responses of thirty glaucomatous eyes to local block of the stellate ganglion with procaine. In simple glaucoma there is an immediate rise in intraocular pressure, which is followed by a fall to the original pressure and somewhat below it. In congestive glaucoma with a structurally open angle the intraocular pressure falls at once to levels below that found before injection. In congestive glaucoma with a partially closed angle the intraocular pressure behaves as in simple glaucoma, i.e., an initial rise is followed by a fall, but with a completely closed angle the intraocular pressure rises at once and there is no subsequent fall; in effect, an acute attack of glaucoma is precipitated.

The behaviour of the aqueous veins in simple glaucoma was studied. The recipient laminated veins at first fill with blood and regain their laminated appearance when the intraocular pressure falls. In congestive glaucoma the aqueous veins remain clear throughout the period of observation if the angle is structurally open. The pupil contracts on the side of the injection even in the dark.

In simple glaucoma dilatation of the intraocular capillary bed cannot be rapidly compensated by displacement of intraocular fluid because the rate of drainage of aqueous is below normal. A sudden and early rise of intraocular pressure occurs. In congestive glaucoma it seems probable that, so long as the angle is open, a dilatation of the intraocular capillary bed immediately displaces aqueous from the eye, and that the increased intraocular capillary volume is so rapidly and effectively compensated that the height of the intraocular pressure remains unaffected. If the venous fall is causative, then the fall in intraocular pressure following sympathetic block may be regarded as a secondary result of its effect on venous pressure. It is probable that the formation of the intraocular fluid is equally affected by sympathetic block in both types of glaucoma, and that this factor does not contribute to the difference in the reactions of their intraocular pressures. Procaine block of the stellate ganglion is useless as a therapeutic measure even when the angle of the anterior chamber is open, and, when the angle is closed, in congestive glau-

coma, it may be dangerous. (5 figures, 14 references) Orwyn H. Ellis.

Nakaji, H. **Change in the ocular tension by electroshock.** Acta Soc. Ophth. Japan **57**:905-914, Aug., 1953.

A sudden and considerable (2.5 to 18.5 mm. Hg) increase in ocular tension of 30 to 60 minutes' duration is brought about in man and in the rabbit immediately after the electroshock routinely used by psychiatrists. In most human subjects there is a recurrence of a slight increase after an interval of time, but not in the rabbit. The first increase is proportionate to an increase in blood pressure but the second is not. The increases are apt to be greater in subjects who have been treated with shock by insulin. The author considers this a manifestation of the crossed sensitization of Selye. He further discusses the general adaptation syndrome of Selye as an etiologic factor in glaucoma. (6 figures, 3 tables, 28 references) Yukihiko Mitsui.

Nonay, T. **Cataract extraction in primary glaucoma.** Klin. Monatsbl. f. Augenh. **123**:257-267, 1953.

A total iridectomy was the rule with 69 eyes which were operated on; 57 eyes had a previous glaucoma operation. The extraction was done without any modifications. In 37 eyes the tension was stabilized after the extraction and 23 eyes required miotics only to hold the tension within normal limits. (1 figure, 4 charts, 10 references) Frederick C. Blodi.

Poos, F. **Spontaneous cure of an acute glaucomatous attack and the mode of action of an iridectomy.** Klin. Monatsbl. f. Augenh. **123**:277-283, 1953.

The author observed three cases of spontaneous cure of acute glaucoma with atrophy of the iris. This atrophy could be accompanied by a simultaneous atrophy of the ciliary body as both organs are fed from the same arterial circle. The author speculates on a similar effect of an iridectomy and advises, therefore, a broad and total excision of the iris. (6 references) Frederick C. Blodi.

Radnót, M. **The effect of castration upon the intraocular pressure.** Ophthalmologica **125**:171-175, March, 1953.

Well known from previous publications on the effect of endocrine disturbances upon the intraocular pressure, Radnót reports two additional cases suggesting a depressor effect of castration. (7 references) Peter C. Kronfeld.

Rohrer, F. **Comparison of the effects of cyclodialysis and trephining in glaucoma.** Klin. Monatsbl. f. Augenh. **123**:268-277, 1953.

This comparison is based on the material of the clinic in Basel, Switzerland. Before 1948 cyclodialysis was the rule and 82 patients could be followed. After 1948 the trephine operation was adopted and 81 cases were studied for comparison. The tension was normalized more frequently after a trephining (80 percent) than after a cyclodialysis (68 percent). 21 eyes needed at least one operation after a cyclodialysis, while only 9 patients had a secondary procedure after the trephining. Cataract seemed to develop more rapidly after a trephining. (12 references) Frederick C. Blodi.

Suda, K., and Kiritoshi, Y. **Distribution of normal intraocular tension.** Acta Soc. Ophth. Japan **57**:886-892, Aug., 1953.

In 3,174 normal eyes the tension was measured by means of a Schiøtz tonometer. The distribution is neither a binominal nor a logarithmic binominal, both in an analysis of total cases, and in that of a cross section for each ten years of age. The authors consider, however, that it may be treated as a binominal in clinical statistics as it is "approximately binom-

inal." There is no correlationship between the tension and the age. The range of tension in these eyes is from 9.0 to 29.3 mm. Hg, mostly (94.5 percent of the total cases) in the range of from 12.2 to 24.5 mm. Hg. Therefore, a tension below 12 mm. Hg or over 25 mm. Hg must be given particular attention in routine practice. (6 figures, 2 tables, 33 references)

Yukihiko Mitsui.

Valdeavellano, Jorge. **Some considerations on the surgical treatment of the glaucomas.** Rev. Peruana de otorrinolaring. y oftal. **4**:14-23, July-Dec., 1952.

The author reviews the pathogenesis of the glaucomas and then describes the drawbacks of the various operations for this condition. Iridencleisis is the least traumatizing of all the operations for glaucoma. The effects of this operation are more constant and the technique is simpler. He presents a series of 18 cases of glaucoma, one of which was secondary to iridocyclitis, 5 were acute, and 12 of the chronic simple type. On all of these eyes he performed iridencleisis. He obtained a satisfactory reduction of pressure in all but two cases. His period of observation was unfortunately of only five months duration in the longest. (43 references)

Roberto Buxeda.

Weekers, R. and Delmarcelle, Y. **Pathogenesis and treatment of intraocular hypertension due to delayed reformation of the anterior chamber after lens extraction.** Ann. d'ocul. **186**:415-443, May, 1953.

The persistence of choroidal detachment with delayed reformation of the anterior chamber after a cataract extraction inevitably gives rise to annular goniosynechiae. In almost half the cases, these increase the resistance to the outflow of aqueous humor and are the cause of the ocular hypertension. The alteration in the ocular tension is frequently overlooked. D.F.P. and retrociliary diathermy are the treatments of choice. (9 figures, 43 references)

John C. Locke.

Williamson-Noble, F. Z. **Detection of glaucoma in general practice.** Brit. J. Ophth. **37**:565-568, Sept., 1953.

The detection of an arcuate scotoma is selected as a very satisfactory indication of glaucoma and a simple instrument for a simple test for the recognition of the scotoma has been devised and is described. The arrangement is a variant of the cross and dot on a card for the demonstration of the normal blind spot. It consists essentially of a white bar about 15 cm. long with a black dot 3 mm. in diameter at one end and a black cross on a movable cursor. First the existence of the blind spot is established and then the board is held vertically and the test repeated for evidence for a possible arcuate scotoma. (1 figure, 1 reference)

Morris Kaplan.

10

CRYSTALLINE LENS

Agarwal, L. P. **Curare and curare-like products in cataract surgery.** Brit. J. Ophth. **37**:558-561, Sept., 1953.

In this study curare was compared with curare-like drugs on 75 patients. The three drugs used were d-tubocurarine chloride, dimethyl tubocurarine iodide and gallamine triethiodide and each was used in 25 unselected cases. The three drugs were found to be very nearly alike in action but dimethyl tubocurarine iodide appeared to be the safest. (9 references)

Morris Kaplan.

Arruga, Alfredo. **Experiences with the Ridley lenticulus.** Tr. Ophth. Soc. Australia **12**:67-79, 1952.

The lenticulus is sterilised in quaternary ammonium compound. Avascular corneo-corneal section is preferred. Special forceps for holding the lenticulus are illustrated. The anterior lens capsule is re-

moved with forceps and an extracapsular extraction performed. Lens matter is irrigated away under ultraviolet light examination. The lenticulus is slid just within the lower margin of the iris, the forceps disengaged, and the remainder of the iris eased over the lenticulus. Neither mydriatics or miotics are used. Pigment usually covers the anterior lens surface but disappears completely after some months. Short wave therapy has considerably accelerated the post-operative course. Eyes with atrophic rigid iris should be excluded. The results of 25 operations are tabulated. Ronald Lowe.

Miller, H. A. **Replacement of the crystalline lens by an acrylic lens in the operation for cataract.** Ann. d'ocul. **186**:312-332, April, 1953.

The author describes the main chemical and physical characteristics of the acrylic lens. His still too limited experience with the operation allows him only to sketch a rough outline of its indications. He draws attention to the encouraging results obtained by Ridley and by himself and emphasizes the principal physical, biological and physiological problems created by the presence of an artificial lens in the eye. (10 references, 6 figures)

John C. Locke.

11

RETINA AND VITREOUS

Amsler, Marc. **Earliest symptoms of diseases of the macula.** Brit. J. Ophth. **37**: 521-537, Sept., 1953.

Diseases of the macula are becoming more common as the life span increases. Diagnosis should be made early, and treatment can be effective. With frequent use of the binocular ophthalmoscope, the red-free light and the focal illumination of the slitlamp for fundoscopy, the very early changes in maculopathies can be ascertained, but even more important is the proper interpretation of the subjective complaints of the patient. Qualitative changes in vision are often complained of by the patient long before organic changes are evident; these can be more easily recorded by use of a system of cards with grid lines or squares of equal sizes and intensities. The patient fixes on these lines at reading distance and describes variations in parallelism or in size or intensity of lines indicating qualitative changes in macular perception. Similarly, relative or translucid scotomata are seen and usually accurately described by the patient. The underlying cause is usually vascular in nature probably at the level of the pigment epithelium and is essentially a fluid disturbance interfering inconstantly with nutrition of the retinal cells. Treatment should be energetic and consists principally of rest for the macula, preferably in the hospital, elimination of all general foci of infection, liberal and prolonged use of vasodilators, such as ronicol and priscol, retrobulbar injections of 1-percent atropine solution, generous use of vitamins and the employment of tissue therapy after the manner of Filatov. (10 figures, 19 references) Morris Kaplan.

Arruga, H. **The pathogenesis and postoperative treatment of detachment of the retina.** Ann. d'ocul. **186**:507-511, June, 1953.

Arruga takes issue with the statements of Magitot (published in the "Annales d'oculistique," October, 1952): that detachment of the retina is in 95 percent of cases the result of pathological activity of the pigment epithelium; that this layer is a gland; that it is not the vitreous which penetrates the retinal tear, but fluid secreted by the pigment epithelium; that in surgical treatment it is unnecessary to aim for the tear, as long as the cauterizations are placed in its vicinity; that it is not necessary to prolong the time in bed, that one can sit up on the fifth postopera-

tive day, providing the eyes are bandaged until the seventh day and stenopoeic spectacles are then worn.

Arruga counters with the ideas of Gonin: that the detachment is a mechanical accident; that in most cases there is an atrophy of the retina, with adhesions to the vitreous framework; that with movements and blows and retraction of the framework the retina is torn at one place; that the vitreous strikes the edges of the tear and enlarges it and passes behind it; that only exceptional and atypical cases are produced by choroidal exudation, usually without a tear; that in the surgical treatment one should surround the tear with retinal coagulations; that postoperative rest in bed with a binocular bandage for 10 to 20 days is of the greatest importance.

Magitot replys graciously.

John C. Locke.

Ashton, N., Ward, B., and Serpell, G. **Role of oxygen in the genesis of retrolental fibroplasia.** Brit. J. Ophth. **37**:513-520, Sept., 1953.

After all the study and controversy over the nature of retrolental fibroplasia, it is now rather well accepted that the earliest changes in the disease are angioblastic in nature and are an overgrowth of the developing retinal vessels. This fact prompted this study of retinas of newborn kittens in whom the retinal vascular structure very closely resembles that of the human eye about three weeks before full-term birth. The immediate and remote effects of high, moderate and low concentrations of oxygen upon the process of retinal vascularization during the first three weeks of the kitten's life were studied. The animals were placed in gas chambers receiving a constant flow of oxygen at 75 to 80 percent concentration and at the end of each experiment one eye was removed while the other was injected with india ink through the left ventricle.

The retinal vascular tree normally is quite full and becomes more full toward the periphery. In the oxygenated animals this vascular tree disappeared entirely although some vessels did return if the animal was allowed to breathe normal air, but the architecture of the normal tree was not restored. The findings showed quite conclusively that high concentrations of oxygen do obliterate developing retinal vessels and that some of these obliterated vessels contain trapped blood. This entrapped coagulated blood seems to have some bearing on the irreversibility of the degeneration, though some vessels seem to be re-established after exposure to normal air. This blood supply to the retina is inadequate and results in retinal detachment and abnormal vessel proliferation. It is considered likely that the pattern of destruction in the human premature infant is similar. (7 figures)

Morris Kaplan.

Beardwood, J. T., Jr., and Truman, R. H. **The problem of diabetic retinopathy.** J. Michigan M. Soc. **52**:1074-1079, Oct., 1953.

The authors present a considerable array of proponents of the normal diet and rigid control school, in the solution of the problem of the influence of the control of diabetes on the development of vascular lesions. In their all-inclusive series they found that the incidence of extensive retinitis was significantly less in the patients having adequately controlled diabetes for six to 20 years or more. The value of rutin is doubtful, yet it seems to have helped where there was evidence of capillary fragility; the use of rutin decreased the fragility. The role of the adrenals in the pathogenesis of diabetic retinopathy is thought by some to be considerable, by others inconstant. The authors wonder if one can postulate that the diabetic with increased adrenal function is more difficult to control or more

careless than one with normally acting adrenals. Francis M. Crage.

Cima, V. **Juvenile retinal degeneration with multiple miliary aneurysms, type Leber.** Boll d'ocul. **32**:549-555, Sept., 1953.

A 16-year-old boy developed unilateral retinal lesions similar to those encountered in retinosis circinata but grouped in a different pattern (colored drawing) in the posterior pole of his right eye. Besides, some arterioles in the macular and adjacent area had multiple aneurysmatic dilatations. Skin angiomata were seen in the father and some relatives. Differential diagnosis of this disease (which Leber had described in 1912) from Hippel-Lindau angiomatosis retinae and Coats' exudative retinitis is discussed; treatment can be either irradiation (X-ray or radium) or diathermycoagulation of the aneurysms. (1 figure, 19 references)
K. W. Ascher.

Flynn, James A. F. **Eclipse blindness.** Tr. Ophth. Soc. Australia **12**:7-14, 1952.

Infrared-ray burns are likely to damage the macula after watching eclipses of the sun. Ophthalmoscopically the damaged retina first appears white and edematous, then red and later dark gray. With more severe damage a hole may form at the macula. In Australia an eclipse of the sun occurred Sunday afternoon August 1, 1943. Eighty case histories were collected after this eclipse. Some of these are classified and the types of glasses thought to be protective are tabulated with their light transmissions. Ordinary sunglasses and most welder's goggles are shown to be inadequate. An indirect method of safely watching an eclipse of the sun is illustrated and described. An image of the sun is projected onto a cardboard screen through a pinhole opening in another card. The importance of publicity in prevention is stressed. Ronald Lowe.

Gordon, Dan M. **Retinitis pigmentosa "sine pigmento" associated with vitiligo of the skin.** A.M.A. Arch. Ophth. **50**:372-374, Sept., 1953.

The clinical signs and symptoms of retinitis pigmentosa were demonstrated in a patient with semi-albinotic fundi. The patient also showed vitiligo and poliosis. (1 figure) G. S. Tyner.

Heinsius, Ernst. **The treatment of diabetic retinitis.** Arch. f. Ophth. **153**:459-470, 1953.

The purpose of these therapeutic suggestions is to induce the ophthalmologist to try some of the following procedures in cases of retinal arteriosclerosis, capillary damage and periphlebitis: for general treatment, insulin, diet and counteracting an overactive adrenal cortex with sex hormones; for local treatment and prophylaxis, vitamins C, K, and rutin; and for improvement of the retinal circulation, nicotinic acid, calcium as a hemostyptic, and dionin for resorption of hemorrhages.
Ernst Schmerl.

Infante, Francisco. **Scleral resection as an aid in the treatment of retinal detachment.** Arch. oftal. Buenos Aires **28**:254-268, June, 1953.

After a short review of the history of the procedure devised by Müller in 1903 and strongly supported by Lindner since 1933, the author describes the technique to be followed when scleral resection is employed in association with diathermic punctures in cases of extensive and long-standing retinal detachment. Special emphasis is laid upon the convenience of performing only a lamellar resection, according to Dellaporta's and Paufique's recommendations, for the risks which attend total resection are in this way almost completely obviated. Seven patients with unfavourable prognosis were operated upon,

and in four of these good results were attained. (7 references)

A. Urrets-Zavalia, Jr.

Kennedy, R. J., and Kazden, P. **End results in retinal detachment surgery.** Cleveland Clin. Quart. **20**:441-444, Oct., 1953.

The authors report their experience in the treatment of retinal detachment in 102 patients from 9 to 76 years of age. The operation was a combination of surface coagulation and penetrating diathermy; in 49 patients the operation was successful for at least six months, in 32 there was improvement in vision, in 5 no improvement in vision, and in 12 the vision was decreased. In this series the results in eyes without a hole in the retina were more successful than in those with a hole. Adequate bed rest is important. (3 tables)

Herman C. Weinberg.

Koch, C. **Experimental production of membranes in vitreous and subretinal fluid.** Ophthalmologica **124**:340-352, Dec., 1952.

This is an in vitro study of the microscopic changes that occur in human vitreous and subretinal fluid under the influence of moderate heat. The most striking finding was the development of delicate transparent membranes, either on the surface of the specimen or around air bubbles arising within the specimen. These membranes are apparently not made up of precipitated proteins. The author draws a parallel between his experimental findings and clinical observations. (9 figures, 7 references)

Peter C. Kronfeld.

Mallek, H. **A review of 46 cases of retrolental fibroplasia in the Vancouver area.** Tr. Canad. Ophth. Soc. **5**:51-63, 1952.

During 1946 and 1947 four premature infants in Victoria developed retrolental fibroplasia and none since, but 46 cases of retrolental fibroplasia have occurred in the Vancouver area since 1948. The earliest signs occur at the fourth to the sixth week. They are a vitreous haze, and a pupil which does not dilate well. The veins take on a ribbon-like appearance and neovascularization occurs in the areas of edema. The arteries become tortuous. These changes may occur in quadrants only, or in the whole peripheral retina. Strands of fibrous tissue invade the vitreous. The retina is pulled off, rather than pushed off, by edema. Both eyes are involved, although often unequally. The disease takes 4 to 6 weeks to develop. Except in the advanced cases, regression of all signs may occur. A-tocopherol, ACTH, and cortisone have not been beneficial.

If the mother is told the child is blind while it is still in the premature nursery she may reject her infant. If the physician waits until the child is home a while, before telling, acceptance by the parents will be more complete.

John V. V. Nicholls.

Mawas, Jacques. **The pigment epithelium of the retina.** Ann. d'ocul. **186**:488-506, June, 1953.

The author reviews his own investigation of the normal and pathologic physiology of the pigment epithelium of the retina under the headings: pigmentary, secretory, phagocytic, differentiative, and proliferative functions. He then considers its disorders in myopia, retinal detachment, cataract, glaucoma, and in tumors of the pigment epithelial layer. In spite of the impressive names of de Wecker and of Leber and of the very interesting report of Gonin, the author is not at all convinced of the importance of the role of the vitreous in the pathogenesis of idiopathic detachment of the retina. Detachment of the retina, that is, the separation of the optical part of the retina from the

pigment epithelium, can only be produced when there is a lesion of the pigment epithelium, itself secondary to a disorder of the choroid. The diseased epithelium allows fluid to transude from the choroid to detach the retina. It is in the choroid and pigment epithelium, rather than in the vitreous, that the cause of detachment of the retina must be looked for. (17 references) John C. Locke.

Noyszewska, K. **Results of electrotherapy in the cavernous degeneration of the macula.** Klinika Oczna **23**:75-81, Jan., 1953.

In three cases of hole in the macula, treatment with galvanic current was applied. In two of these the holes were due to senile degeneration and in one it was traumatic. One-tenth milliampere of current was applied for five minutes every second day; the anode was applied to the eyeball and the cathode to the occipital region. Vision was restored to normal in one patient and to 5/9 and to 4/15 in the other two. Sylvan Brandon.

Paycha, François C. **Study of the predisposing role of vitamin A deficiency in retinal detachment.** Arch. d'opht. **13**:272-276, March, 1953.

The author discusses the theories of etiology of retinal detachment, such as traumatism, myopic alteration, vascular lesions, and choroiditis, and concludes that still unknown predisposing causes must exist. In nine cases of detachment the patients were subjected to complete clinical study and to adaptometry and chemical analysis of the aqueous humor. From these studies he concludes that no matter what the precipitating cause the detachments evolved in an identical manner characterized by a progressive increase in albumin, by a degeneration of the retinal elements, and by avitaminosis or hypovitaminosis. He concludes further that there exists a relationship between retinal detachment and vitamin A deficiency which merits further exploration. Phillips Thygeson.

Pignalosa, G. **A case of thrombosis of the central retinal vein in a young subject with a nephropathy due to a dental focus.** Ann. di ottal. e clin. ocul. **79**:251-255, April, 1953.

The condition described in the title subsided after heparin therapy, removal of the focus and ensuing recovery from the abnormality of the kidney. The hypothesis is offered that the retinal vessel was locally damaged by toxin from the dental focus and that the toxins or organisms from the renal focus provoked the thrombosis consequently. (27 references) John J. Stern.

Reynon, M. **Retinal hemorrhages in blast-injuries.** Ann. d'ocul. **186**:512-522, June, 1953.

During the campaign in Indo-China the author was able to study and follow two hemorrhagic retinal syndromes in blast-injured patients. In one primary retinal hemorrhages appeared immediately after a blast. In the other syndrome, termed secondary, retinal hemorrhages appeared in four to eight days after the blast and cleared with complete recovery within fifteen days after institution of high-dosage multivitamin therapy (vitamins P, K, C.) This medication is valuable not only as a therapeutic measure, but also as a prophylactic one, and the author stresses the importance of routine fundus examination in every blast-injured patient. (38 references, 3 figures) John C. Locke.

Rizzoli, E. **Gonioscopic observations in retinitis pigmentosa.** Rassegna ital. d'ottal. **22**:168-175, March-April, 1953.

One characteristic of pigmentary degeneration of the retina is the migration of granules of pigment, which, in some

cases, might lead to the development of glaucoma. Von Hippel even suggested that this might be the cause of primary glaucoma. In six cases studied carefully by Rizzoli, there was no evidence of increased pressure in the eye nor any signs which would suggest the later development of glaucoma. Pigmentation of the angle was moderate in some cases and more marked in others. There was, however, a relationship between the color of the iris and the presence of pigment in the angles. (7 colored figures)

Eugene M. Blake.

Robertson, R. W. **Statistical study of retinal detachment.** Tr. Canad. Ophth. Soc. **5**:122-137, 1952.

The postoperative follow-up of 138 cases of retinal detachment is presented of which 55 percent were cured. The average age of the patients of whom 55 percent were men was 45 years. The right eye was affected in 59 percent of the cases and 49 percent had a myopia of more than one diopter. The percentage of cures fell as the duration of the detachment increased. A history of trauma was given by 17 percent of the patients. Holes were most frequent in the upper temporal quadrant; cures were more frequent when only one quadrant was detached. Retinal holes were found in 86 percent of patients who were treated successfully and in only 49 percent of the failures. Repeated operations were successful in 56 percent of cases. Aphakic eyes formed 8 percent of the series, successful reapposition of the retina was obtained in 45 percent of these. Scleral resection was successful in one of four cases. Complications included uveitis, removal of four eyeballs for possible tumor, glaucoma, vitreous hemorrhage, and intercurrent medical illness. (14 figures, 9 references)

John V. V. Nicholls.

Salzmann, Maximilian. **Involution of cilioretinal arteries.** Arch. f. Ophth. **153**:451-458, 1953.

The author presents two drawings of his fundi which were made when he was 25 years of age. Both eyes clearly show cilioretinal bloodvessels. Two photographs of the fundi taken more than 60 years later demonstrate that the pictures now and then are comparable and they further prove the disappearance of some of the cilioretinal vessels. A study of the original paper is highly recommended.

Ernst Schmerl.

Sansone, G., and Mariotti, L. **The ocular manifestations of acute leucemia in childhood with special consideration of leucemic retinopathy.** Ann. di ottal. e clinica ocul. **79**:169-194, March, 1953.

Forty-two cases of acute leucemia were observed in children, 17 of whom were treated with aminopterine (4-aminopteroylglutomic acid, folic acid antagonist). Retinopathy, characterized by retinal pallor, venous engorgement and hemorrhages, is extremely frequent in acute leucemia; but hemorrhages with white centers were not observed as frequently as by other authors. In 25 patients there was a clear connection between hemorrhages in the eyes and in other parts of the body. Only in five patients were they the only hemorrhagic manifestations. In all cases there was a low platelet count and a diminution of megakarcyocytes in the bone marrow. If the patients survive long enough retinopathy always appears. The effectiveness of treatment with folic acid antagonists and cortisone is variable. Ocular hemorrhages indicate the seriousness of the prognosis. Eleven eyes were examined histologically and the typical changes were leukemic infiltration of the choroid (60 percent), edematous or hemorrhagic infiltrations of the retina (70 percent), and optic neuritis with proliferation of the neuroglia.

J. J. Stern.

Scuderi, G. **Junius' juvenile macular exudative retinitis.** Boll. d'ocul. **32**:463-488, Aug., 1953.

Four patients, two male and two female, 19 to 30 years old are described in detail. The differential diagnosis from a number of somewhat similar entities is discussed, namely: Masuda's central serous retinitis, Horniker's angioneurotic retinitis, Scuderi's retinitis exudativa externa, Dejean's and La Porte's brown macular retinitis and early macular melanoblastoma. The author assumes that the cause is a primary functional disturbance of allergic or vasoneurotic character located in the chorio-capillaris and the perimacular retinal vessels; there are permeability changes, followed by macular edema, exudation which interferes with the vitality of the pigment epithelium, proliferation of the latter and subretinal fluid collection. Hemorrhages and connective tissue formation are the third stage, accompanied by necrosis with moderate or absent lymphocytic infiltration of the choroid. (8 figures, 38 references)

K. W. Ascher.

Shapland, C. Dee. **Lamellar sclerectomy.** Tr. Ophth. Soc. U. Kingdom **72**:119-143, 1952.

Lamellar sclerectomy was performed under general anesthesia induced by gas and oxygen given intratracheally and pentothal intravenously. The sclerectomy was centered on the main visible rent in the retina and the incision traversed about one half of the circumference of the globe. The rectus muscle in the center of the area was temporarily severed. Catgut sutures were inserted on its border 2 to 3 mm. from its insertion and a retraction suture of No. 1 silk was put into its stump. The exposed sclera was cleaned and points on its surface 10 mm. from the limbus marked with a cautery at the two borders of the divided rectus and at the borders of the two other rectus muscles adjoining the operative field. Cautery marks were also placed to mark the area to be resected. The resection is commenced at the cautery mark at one end of the area to be resected. A sharp ground-down Graefe knife is used for the resection and all but the deepest scleral lamellae are removed, leaving tissue of paper thickness between the knife and the suprachoroidal space. Next 1 or 2 mimins of 1½ percent caustic potash solution are inserted into the suprachoroidal space over the area of the retinal hole with a tuberculin syringe; the terminal 5.0 mm. of the needle is bent at right angles. The intraocular tension must be lowered before the sutures are tied and this is affected by a catholysis puncture over an area where the retina is deeply detached and where most of the subretinal fluid is. The average length of the scleral strips was 30 mm., the width not over 6.0 mm. The advantage of lamellar resection over full thickness scleral resection is that it is less time consuming and there need be no bulging of the choroid. The author reports upon 43 patients and in 13 a resection of the complete circumference of the globe in a two stage operation was carried out. Sclerectomy is advised as a primary procedure in myopia with multiple tears, in aphakia, especially when no retinal hole can be found, in elderly subjects with multiple tears in an atrophic retina, in retraction of the vitreous after vitreous hemorrhage in old detachments, and as a secondary procedure after detachments unsuccessfully treated by diathermy. (7 tables)

Beulah Cushman.

Shima, D. **The measurement of retinal vessel caliber in patients with renal disorders.** Acta Soc. Ophth. Japan **57**:499-534, July, 1953.

In eight cases of nephrosis there was no change. In 73 cases of acute and chronic nephritis and seven cases of pregnancy nephritis there was a contraction of the

retinal artery parallel with the increase in blood pressure. A dilatation of the retinal veins was seen in none of the patients but there was a tendency to venous contraction with hypertension. The degree of arterial contractions was higher in cases of renal hypertension than in cases of essential hypertension; in cases of sclerosis the converse was true. Albuminuric retinitis was observed more frequently in renal than in essential hypertension. (29 figures, 91 tables, 23 references)

Yukihiko Mitsui.

Siliato, F. **The pathogenesis of diabetic retinopathy (experimental contribution and general considerations).** Ann. di ottal. e clin. ocul. **79**:145-156, March, 1953.

Four pancreatectomized dogs were kept alive with insulin and the lipotropic factor (anti fatty-liver factor). Weekly ophthalmoscopic examinations over a period of six weeks failed to reveal any fundus changes. Four other pancreatectomized dogs received insulin alone. During the fourth week disseminated hemorrhages were observed, larger near the posterior pole, smaller in the periphery where they were punctiform. In the fifth week the peripheral hemorrhages were as large as the central ones. In the sixth week some of the hemorrhages became confluent and the fundus assumed a reddish tint. These findings point to the importance of the altered fat metabolism in the pathogenesis of diabetic retinopathy. John J. Stern.

Siliato, Francesco. **The fibrolytic enzyme in the treatment of thrombosis of the central retinal vein.** Ann. di ottal. e clin. ocul. **79**:223-236, April, 1953.

Intravenous injection of fibrolytic enzyme of pancreatic origin had no effect in four cases of thrombosis of the central retinal vein of long standing (weeks or months). In four others where the therapy immediately followed the vascular accident, a recanalization of the vein and regression of the edema and hemorrhages was observed. During this treatment the coagulation time, prothrombin activity and heparin activity had not undergone any changes. No intolerance towards the treatment was encountered. (22 references) John J. Stern.

Toda, S. **A study of vitreous replacement.** Acta Soc. Ophth. Japan **57**:439-447, July, 1953.

The vitreous was replaced in the eyes of rabbits with vitreous from the same animal and from other animals. Good results were obtained in 18 of 68 eyes. In the other eyes, such complications as hemorrhage into the vitreous, cataract, damage to the retina, ocapity of the vitreous and detachment of the retina followed the replacement. The heteroreplacement, using dog, cat, and human vitreous, did not cause more complications than auto-replacement. A replacement of less than 0.7 ml. vitreous, a puncture of the sclera 5 to 6 mm. from the limbus, insertion of the needle into the posterior part of the viterous and a diathermy coagulation of the sclera at the site of puncture seem to give good results. (1 figure, 7 tables, 16 references)

Yukihiko Mitsui.

Vrabec, F. **Verrucosities of the internal limiting membrane of the retina.** Ophthalmologica **125**:164-168, March, 1953.

The author describes hyaline excrescences of the internal limiting membrane in the human retina, very similar to the hyaline excrescences of Bruch's membrane. (4 figures, 5 references)

Peter C. Kronfeld.

Wilczek, M. **New instruments and methods of operations in the vitreous.** Klinika Oczna **23**:57-62, Jan., 1953.

In order to remove intravitreous foreign bodies the author devised an instrument permitting him to grasp them under visual control and to remove them. Essen-

tially the instrument consists of a canula and elastic wire hooks, which spread out when pushed out and close in when pulled back. The approach is through the sclera opposite the site of the foreign body. A 1½-mm. trephine opening is made in the center of the scleral incision, safety sutures are placed and the instrument is introduced into the vitreous. Under visual control with an ophthalmoscope the foreign body is grasped and removed. Sutures are tightened immediately to prevent vitreous loss. When vitreous is lost spinal fluid from the same patient is injected intraocularly. Cauterization with diathermy is used to prevent retinal detachment. (4 figures)

Sylvan Brandon.

Williamson-Noble, F. A. **Venous pulsation.** Tr. Ophth. Soc. U. Kingdom **72**:317-326, 1952.

Venous pulsation of the central retinal vein is visible where the vein turns down to enter the physiological cup, and pulsation has been noted in the primary and even in the secondary branches of the vein. The basic pulse and the piston-like pulse in the disc are described. Venous pulsation produced by pressure on the globe was found in a patient with suspected frontal meningioma. With models one can demonstrate that fluid, passed from a region of higher to one of lower pressure, under certain conditions develops spontaneous pulsation, and also that when fluid flows from a tube of wide caliber to one of narrower caliber, the pressure falls and the fluid develops pulsation. The veins in the retina are better supported and may even be held open by the surrounding tissues. The proximity of the artery to the vein may allow for direct transmission of the pulse. Paton and Holmes favored the theory that compression of the central retinal vein in the subdural space of the optic nerve produced papilledema. Beulah Cushman.

Wittich, K. **Embolus of a retinal arteriole in juxtapapillary chorioretinitis.** Klin. Monatsbl. f. Augenh. **123**:356-361, 1953.

A 26-year-old man presented the ophthalmoscopic picture of a chorioretinitis adjacent to the disc. A cilioretinal artery crossing this area was temporarily obstructed. The author assumes that this vascular obstruction was secondary to the inflammation. (4 figures, 14 references)

Frederick C. Blodi.

12

OPTIC NERVE AND CHIASM

Fine, M., and Flocks, M. **Bilateral acute neuroretinitis with sarcoidosis treated with corticotropin and cortisone.** A.M.A. Arch. Ophth. **50**:358-362, Sept., 1953.

A case of bilateral optic neuritis due to sarcoidosis is reported. Corticotropin and cortisone were successful in bringing about a rapid recovery. Fundus photographs and photomicrographs of a lymph node biopsy are included. (3 figures)

G. S. Tyner.

Ishizawa, N. **Percentage increase in electrical excitability (ζ of Motokawa) of the eye with retrobulbar optic neuritis.** Acta Soc. Ophth. Japan **57**:824-829, Aug., 1953.

Motokawa defined ζ as $100(E_t-E_o/E_o)$, where E_o is the electrical excitability of the eye measured by electrical phosphene as the indicator after 40 minutes' dark adaptation and E_t is that of the same eye measured similarly t-seconds after an exposure to light (J. Neurophysiol. 12:291, 1949). The ζ-t curve has the apex at the point of 2 seconds of t in the normal eye. In retrobulbar optic neuritis with much reduction in vision there is a considerable dislocation of the apex or an appearance of multiple apexes. A considerable change in the curve with little disturbance in vision is also brought about in retrobulbar

neuritis and the test is considered valuable in the diagnosis of such cases. (9 figures, 16 references)

Yukihiko Mitsui.

Kwaskowski, A. **Difficulty in the diagnosis of choked disc.** Klinika Oczna **23**:63-74, Jan., 1953.

Differential diagnosis between optic neuritis and choked disc is not always easy. Edema may be present in neuritis and the impairment of vision may not be great. Choked disc develops when there is a difficulty in drainage of the central retinal vein. The ophthalmodynamometric measurements of the diastolic pressure of the central retinal vein, particularly when compared with that in the other eye, helps in the differential diagnosis. Two illustrative cases are presented. (20 references)

Sylvan Brandon.

Lesh, E. R. **Amaurosis in early pregnancy.** Obst. & Gynec. **2**:158-160, Aug. 1953.

The blindness was the result of bilateral optic neuritis and secondary optic atrophy which occurred during severe hyperemesis gravidarum. Early ophthalmic examination should be made in all cases of severe hyperemesis gravidarum and therapeutic abortion is indicated when there are changes in the eyeground.

Irwin E. Gaynon.

Oishi, S., Hasegawa, B., Iwasawa, T., Yagasaki, K., and Suehiro, T. **Clinical and experimental study of chronic retrobulbar optic neuritis caused by carbon monoxide.** Acta Soc. Ophth. Japan **57**:819-824, Aug., 1953.

In 36 of the 119 workers in an iron factory, the authors found chronic retrobulbar optic neuritis. A combination of vitamin B_1 and anterior pituitary hormone therapy was effective. When carbon monoxide was given to rats, there was a considerable reduction in vitamin B_1 excretion in the urine and an increase in alkali-phosphatase in the serum. In hamsters given carbon monoxide, degenerations of the retina and the optic nerve were brought about after 20 and 70 days respectively. (4 tables, 15 references)

Yukihiko Mitsui.

Palich-Szanto, O. **Papilledema in the early stages of lues.** Klin. Monatsbl. f. Augenh. **123**:310-317, 1953.

A case of unilateral papilledema in a 24-year-old man with secondary lues in whom the edema disappeared under penicillin treatment is presented. (2 figures, 20 references) Frederick C. Blodi.

Smith, Redmond. **Case notes: crater-like hole in the optic disc.** Brit. J. Ophth. **37**:122-123, Feb., 1953.

A case showing a crater-like hole in the optic disc with the usual marked field change is reported. The pathology and embryology are discussed. It was thought to be a congenital anomaly. (2 figures, 5 references) Orwyn H. Ellis.

13

NEURO-OPHTHALMOLOGY

Bonavolonta, G. **Changes in the shape of the pupil after diathermy coagulation of the detached retina.** Boll. d'ocul. **32**:257-270, May, 1953.

Fifteen out of 50 patients showed changes in the shape of their pupil after successful diathermy operation (Table). Ten had a wider, one a narrower pupil, three showed excentricity and four irregular shape of the pupil. Location and extent of the operation had some bearing on the postoperative appearance of the pupil, injured branches of the ciliary nerves being probably responsible for the particular alteration. The short ciliary nerves are more often involved and therefore, mydriasis occurs more frequently. (references) K. W. Ascher.

Bonnet, Paul. **Pathologic physiology of pulsating exophthalmos.** Arch. d'opht. 13:233-251, March, 1953.

The author reviews in detail the subject of pulsating exophthalmos of traumatic origin and notes that the well-defined signs of the syndrome may result from different mechanisms. These may include initial cranial traumatism, arteriovenous aneurysm, and circulatory difficulties, especially of the middle cerebral artery. Each of these three mechanisms is discussed completely but the second, arteriovenous aneurysm, receives major attention with illustrative diagrams and fundus drawings. Of special interest is the author's comment on the fundus picture which is that of extreme retinal cyanosis with transudation of plasma through the walls of the veins, followed ultimately by hemorrhages. The mechanism does not always involve an arteriovenous aneurysm but rather a diffuse aneurysm in which the extradural spaces are distended with blood, compressing the cavernous sinus. In this type of pulsating exophthalmos the usual thrill is absent, the head noises are less bothersome, and there is not always true pulsation. The third mechanism involves defective circulation of the middle cerebral artery with resultant ischemia of the nerve centers supplied by the sylvian artery. Motor aphasia is the principal resulting sign.

The author stresses the value of arteriography in diagnosis and notes that treatment of the condition should never consist in a routine ligation of the common or internal carotid. Since the exophthalmos is sometimes opposite to the fistula, visualization is necessary. He concludes by discussing the possibility of ligation of the ophthalmic veins in the orbit. (6 figures) Phillips Thygeson.

Mackensen, G. **Physiology of optokinetic nystagmus.** Klin. Monatsbl. f. Augenh. 123:133-143, 1953.

This psycho-optic reflex can be changed by psychic influences. The nystagmus can be reduced by stimulation of the peripheral retina or by accommodation. If the attention can be concentrated on another problem, e.g. solving a mathematical problem, or fixating an imaginary point, the nystagmus can be suppressed. (9 figures, 25 references)

Frederick C. Blodi.

Miller, H., and Evans, M. **Prognosis in acute disseminated encephalomyelitis; with a note on neuromyelitis optica.** Quart. J. Med. 22:347-380, July, 1953.

This article is based on a study of 34 cases of acute disseminated encephalomyelitis occurring in Newcastle upon Tyne between 1932 and 1942. The view is put forward that acute disseminated encephalomyelitis and disseminated sclerosis are separate diseases which may be difficult to distinguish, but in which distinction is important because of their different prognoses. The syndrome of neuromyelitis optica is discussed, with three illustrations. There is evidence indicating that the condition is entirely separate from disseminated sclerosis, in which its occurrence appears to be not fully authenticated, and that it is closely related to acute disseminated encephalomyelitis.

Theodore M. Shapira.

Mooney, Alan J. **Perimetry and angiography in the diagnosis of lesions in the pituitary region.** Tr. Ophth. Soc. U. Kingdom 72:49-104, 1952.

The author reports the study of arterial displacement by tumors in the pituitary region. He finds that angiography yields information that cannot be obtained by perimetry alone. Percutaneous angiography is a minor surgical procedure and bilateral stereoscopic views allow for very close study of the vascular tree. The suprasellar spread of pituitary tumors can be outlined, and the arterial displacement will

confirm the impression of a space-occupying lesion. Angiography may give the clue as to the indication for surgery when there is a monocular pale disc with a central scotoma or a blind eye. Internal hydrocephalus may be demonstrated when other findings suggest intrasellar tumor. Angiographic evidence suggests that certain field defects are due to vascular impairment. (64 figures) Beulah Cushman.

Moss, G. C. **Cerebral angiomatous malformations.** Australian Ann. Med. **11**:67-77, May, 1953.

Cerebral angiomatous malformations have been found with increasing frequency since the introduction of cerebral angiography. The lesion is a vascular maldevelopment in which a tangled mass of undifferentiated vessels is interposed between arteries and veins. It is not a new growth. The onset of symptoms often occurs in the second or third decade. Epilepsy and intracranial hemorrhage are the commonest manifestations. Sensory defects and hemianopia may be found, a bruit may be pathognomonic. Headache is common but may be absent. Progressive mental deterioration has often been noted. Operative removal planned with the aid of cerebral angiograms may result in complete cure. Ronald Lowe.

Robertson, S. E. J. **Congenital facial diplegia (Moebius's syndrome).** M. J. Australia **2**:335-337, Aug. 29, 1953.

The case of a child with bilateral facial, abducens, hypoglossal and trigeminal palsies is reported. Tears were absent. The medial longitudinal bundle was possibly also involved. In such cases operative treatment of the squint does not make abduction of the eyes possible.

Ronald Lowe.

Small, Robert G. **Optic neuroencephalomyelopathy (Devic's disease).** A.M.A. Arch. Ophth. **50**:368-369, Sept., 1953.

The clinical course of a 35-year-old white woman with Devic's disease is reported. The patient recovered.

G. S. Tyner.

Weskamp, Carlos. **The differential diagnosis of hypophyseal tumors.** Arch. oftal. Buenos Aires **38**:173-181, April, 1953.

When a patient shows partial or total atrophy of the optic disc with bitemporal hemianopsia we immediately think of the possibility of a hypophyseal tumor, but not when there is associated homonymous hemianopsia. In both cases one must consult cranial radiography for a diagnostic decision. The author cites several illustrative cases and concludes that in order to confirm a hypophyseal tumor there must be a concordance of certain specified ophthalmologic and radiographic signs. These include the appearance of the optic disc (there may be atrophy or some edema showing intracranial hypertension), the size and contours of the visual fields (the usual defect is in the upper outer quadrant, but one may find instead central scotomas or homonymous hemianopsia). Since the sella turcica may appear normal in the presence of a hypophyseal tumor, one should repeat the radiography after the injection of air into the medullary cavity in order to make the third ventricle and the chiasmal and interpeduncular cistern visible. Joseph I. Pascal.

Yanagida, N. **Ocular symptoms of pituitary and pontile tumor.** Acta Soc. Ophth. Japan **57**:1293-1305, Oct., 1953.

Observations on 37 cases of pituitary tumor before and after surgery (3 cases of acidophilic adenoma, 32 of chromatophobe adenoma and 2 of malignant growth) are described. When the vision was better than 20/200 a considerable improvement in the vision and in the visual field was found after surgery. The author also reports ocular symptoms in 13 cases

of pontile tumor. Choked disc, palsy of the external rectus and conjugate paralysis were seen in six, eight and seven cases respectively. She considers the disappearance of the corneal sensory reflex to indicate an advanced growth of the tumor. From the standpoint of classification the syndromes of Gubler, Foville, Gaspenini and an unclassified syndrome were seen in 5, 4, 1 and 3 of the 13 cases respectively. (8 tables, 15 references)

Yukihiko Mitsui.

14

EYEBALL, ORBIT, SINUSES

Callahan, Alston. **Intravenous use of corticotropin in angioneurotic edema of the orbit.** A.M.A. Arch. Ophth. **50**:286-288, Sept., 1953.

The systemic use of cortisone and ACTH was successful in relieving the signs and symptoms in a case of angioneurotic edema of the orbit. (1 figure)

G. S. Tyner.

DeVoe, Arthur G. **The orbit.** A.M.A. Arch. Ophth. **50**:375-395, Sept., 1953.

The related literature for 1952 is reviewed.

G. S. Tyner.

Fazakas, Alexander. **The symptomatology of mucoceles.** Ophthalmologica **125**: 175-182, March, 1953.

Of ten cases of mucocele observed by the author eight originated from the anterior ethmoids, one from the frontal sinus and one from both sinuses. Six cases were cured by repeated punctures and conservative treatment. The remaining four patients responded well to surgery. The author attaches a great deal of significance to the visual field findings in chronic sinus disease and particularly to the direction in which the blind spot is enlarged. (8 references)

Peter C. Kronfeld.

Heer, G. **Orbital sarcoma in newborn.** Rassegna ital. d'ottal. **22**:85-96, Jan.-Feb., 1953.

An enlarged mass involving the left eye and orbit was observed at birth. Two other children had been born of healthy parents. The mass made the affected eye protrude 5 centimeters more than the normal eye and prevented movement of the eye. No pulsation was noted. X-ray studies disclosed an enormously enlarged orbital cavity and microscopic examination of tissue revealed a sarcoma of immature cells, some rounded, some polygonal, and one stage corresponded to primative, mesenchymal, embryonal cells. (9 figures)

Eugene M. Blake.

Johnston, K. B. **Inflammatory pseudotumor of the orbit.** Tr. Canad. Ophth. Soc. **5**:94-101, 1952.

A 13-year-old girl who had had protrusion of the left eye for five months showed orbital edema, paresis of ocular muscles, and papilledema. Biopsy of a hard palpable mass under the upper nasal orbital margin showed inflammatory tissue. Orbital decompression was accomplished by removing the orbital plate of the frontal bone. Eight months later the swelling and exophthalmos was much less marked. The term "pseudotumor" is inadequate, but it does indicate the nonmalignant nature of the disease. The etiology is unknown. The important differential diagnosis lies with tumor, myasthenia gravis, and exophthalmos in hyperthyroidism. (3 figures, 8 references)

John V. V. Nicholls.

Love, J. G., and Dodge, H. W., Jr. **Transcranial removal of intraorbital tumors.** Arch. Surg. **67**:370-380, Sept., 1953.

The authors summarize the data from 73 cases of orbital neoplasms treated surgically by the transcranial route. The neuro-surgeon, radiologist, and ophthal-

mologist should all study a patient with a tumor involving the orbital apex or superior orbital fissure, or the cranial extension of a tumor through the orbit. A stainless steel covering for the orbital roof is recommended and the authors describe such a covering in one case. They also recommend the use of a polyvinyl sponge whenever there may be much postoperative orbital edema. (10 figures, 2 tables)

Herman C. Weinberg.

Paul, Milroy. **Case notes: excision of a large orbital dermoid cyst.** Brit. J. Ophth. **37**:114-115, Feb., 1953.

The details of the operation for removal of a large orbital dermoid cyst are given. The mass was found to be sausage-shaped and extended 40 mm. back toward the appex of the orbit. After the contents were lost the cyst was easily dissected out in toto. There were no complications. (4 figures, 2 references)

Orwyn H. Ellis.

Summerskill, W. H. **Modification and defense of the scleral implant.** Brit. J. Ophth. **37**:415-422, July, 1953.

The original Mules operation in which a glass ball is implanted within the sclera after evisceration fell into general discard due to many complications resulting after its initiation. Now it has been revived and re-examined in the light of modern procedures. It has been found to be most satisfactory and is described as being far superior to the ordinary implant within the muscle cone and it provides an almost perfect foundation for a life-like prosthesis. Sympathetic ophthalmia should never occur if the operation is done properly. Infection is avoidable with modern aseptic technique and postoperative reaction can be reduced entirely by placing two holes in the sclera to allow for equalization of pressure within and without the sclera. The procedure is also recommended for delayed implants after evisceration for endophthalmitis.

Morris Kaplan.

Townsend, R. L. H. **Skin grafting of the eye socket following exenteration of orbit.** South African M. J. **27**:606-607, July 18, 1953.

The painful convalescence after exenteration of the orbit was reduced by applying a Thiersch graft in contact with the bony walls of the orbit. A satisfactory prosthesis was worn.

Irwin E. Gaynon.

Toselli, C. **Unusually early appearance of an inflammatory orbital pseudotumor.** Boll. d'ocul. **32**:489-498, Aug., 1953.

A four-year-old girl developed a rapidly growing tumor of her right orbit; the left eye remained normal. Biopsy revealed chronic inflammation. Regression of the tumor was observed after two months of roentgen therapy with 4000 r; the optic nerve became atrophic, the conjunctival edema remained unchanged. (2 figures, 61 references)

K. W. Ascher.

Weille, F. L., and Vang, R. R. **Sinusitis as focus of infection in uveitis, keratitis, and retrobulbar neuritis.** A.M.A. Arch. Otolaryng. **58**:154-165, Aug., 1953.

At the Massachusetts Eye and Ear Infirmary, the records of 427 patients with uveitis were examined; 11 percent of these had some form of sinus abnormality but the latter was probably merely a coincidental phenomenon. Of 198 patients with keratitis, only six had some form of sinus infection which might serve as a possible focus of infection. It is probable that delayed failure in corneal transplanting should be ascribed to the complex foreign tissue protein rather than to foci of infection in the sinus. Sinusitis was found in four of 38 cases of retrobulbar neuritis, and in only one was it an obvious

cause of the retrobulbar neuritis. In this case the infection was massive and caused death in one week. Irwin E. Gaynon.

15

EYELIDS, LACRIMAL APPARATUS

Callahan, Alston. **Corrective surgery of the lids.** Rev. Peruana de otolaring. y oftal. **3**:25-32, Jan.-June, 1952.

The surgical repair of wounds of the lids, and the surgical correction of entropion and ectropion is discussed.

Roberto Buxeda.

Bietti, G. B., and Boles-Carenini, B. **Technique and results of permanent intubation of the nasolacrimal duct with a polyethylene tube.** Boll. d'ocul. **32**:385-400, July, 1953.

A 2-cm. long, 2.8 or 3.5 mm. wide polyethylene tube with a lumen of 1.8 or 2.7 mm. is introduced into a small vertical opening of the surgically exposed anterior wall of the lacrimal sac. Previous probing of the nasolacrimal canal makes the introduction into the bony canal easy; the upper end of the tube is left at the level of the lower end of the lacrimal sac; the incision of the latter is sutured with one catgut stitch. Five clear drawings show the procedure and three roentgenphotograms show the permeability to contrast material. A tabulation of 45 case histories displays age (oldest 77, youngest patient 5 years), period of postoperative observation (longest 18 months), bacteriologic findings, Schirmer's test, epiphora, response to rinsing, and rhinoscopic and roentgenographic findings. Thirty-seven of 45 patients obtained free lacrimal passage; excluding the unfavorable cases, the percentage of good results would be above 88 percent. Possible causes of failure are too-narrow canulas which may be extruded through the nose, too-wide tubes which may become compressed and flattened, false route, severe pathologic changes in the nasal mucous membrane; subsequent atrophy of a narrow lacrimal sac, and slipping of the tube into the lacrimal sac. Advantages are the facility of the operation, its short duration, absence of hemorrhages, high percentage of good functional results and the rapid disappearance of pathogenic organisms from the conjunctiva. (8 figures, 17 references) K. W. Ascher.

Crawford, J. S. **Proptosis in children.** Tr. Canad. Ophth. Soc. **5**:81-93, 1952.

All the cases of proptosis in children at the Hospital for Sick Children, Toronto, during the previous 15 years are reviewed. Of 32 patients with hyperthyroidism 20 had exophthalmos; 25 were girls with an average age of 12 years. Hyperthyroidism occurred in a boy 6 years of age and a boy of 6 months. The exophthalmos was always bilateral. A raised value for the serum bound iodides and a lowered serum cholesterol are aids in the diagnosis. Proptosis occurred in one of seven patients with eosinophilic granuloma and in 12 of 18 patients with Hand-Christian-Schüller disease. These patients, 3 to 6 years of age, had diabetes insipidus and defects of the bones of the skull. Of 7 children with Letterer-Siwe disease one had proptosis. This disease affects children under two years of age, and is rapidly fatal.

Neuroblastoma of the adrenals affects infants and young children. It metastasizes to the orbits, skull, and long bones. The common ocular symptom is a recurrent area of ecchymosis about both orbits. Shortly a firm bony swelling develops. The children show pallor, weight loss, low fever, and anemia. Roentgenograms of the skull, pelvis, long bones, and kidneys aid in the diagnosis. Of 12 patients with neuroblastoma three showed exophthalmos.

There were six cases of hemangioma. Signs of tumor are present at birth, or during the first year. There may be sud-

den variations in the amount of proptosis. Crying may increase the proptosis. There may be a bluish discoloration of the skin of the eyelids. Angiomas of the orbit are frequently associated with angiomas of the lids, caruncle, face and other parts of the body. Of 23 cases of Hodgkin's disease three had proptosis. Of three cases of chloroma all had proptosis. No lacrimal gland tumors were seen during the 15 years. Sixteen children, of a total of 26 with cranio-stenosis, and three of five children with hypertelorism, had proptosis. Acute ethmoiditis was the most common source of orbital cellulitis, and accounted for proptosis in 20 children. (2 tables, 8 references)

John V. V. Nicholls.

Foster, John. **Chondrodermic replacement of full thickness loss of the lids.** Tr. Ophth. Soc. Australia **12**:59-66, 1952.

In repair of the eyelids after congenital defects or extensive lesions, sliding skin flaps are not suitable. The loss of tarsus gives an immobile, shapeless lid, subject to ectropion or entropion. In 1902 Büdinger described replacement of the outer third of the lower lid by a temporal pedicle flap to whose inner side he sewed a curved piece of cartilage and skin taken from the scaphoid fossa. He thus replaced conjunctiva and tarsus with aural tissue. Müller's operation took the replacement a stage further by replacing all three layers at once, removing a section of the crus helicis of the ear with skin on both sides. The aural deformity is slight, and is only noticed on careful examination at right angles. A little graft shrinkage occurs so that it should be made 2 mm. too broad and 1 mm. too thick. Keratitis may be expected from its use for upper lids but in practice serious corneal trouble appears to be rare. Ronald Lowe.

Hudelo, A., and Mergier, J. **Study of the lacrimal pH as a function of local and general states.** Ann d'ocul. **186**:333-343, April, 1953.

The changes in the lacrymal pH in different local diseases were observed. The pH generally diminishes in acute vascularized conditions, but goes up in the same affections when they have lasted a certain time. It is elevated equally in iritis, acute glaucoma and keratoconjunctivitis. The duration of the surface action of collyria is short, about ten minutes. As the affection becomes older, there is a buffering action on the pH, so that collyria are chiefly active only at the beginning of therapy. (9 figures, 5 references)

John C. Locke.

Lagos, Eduardo J. J. **Zarzycki's operation (lacodacryocystostomy).** Arch. oftal. Buenos Aires **28**:241-244, June, 1953.

Lacodacryocystostomy (Zarzycki, M. P.: Bull Soc. Opht. Paris 49:9, 1937) is an operation intended to obviate the stasis resulting from strictures of the lacrimal canaliculi by establishing a communication between the conjunctival cavity at the inner canthus and the tear sac. Both canaliculi are split with a narrow, sharp knife until the sac is largely open, and the bulbar conjunctiva is undermined near the caruncle. The anterior and posterior walls of the sac are sutured to the corresponding edges of the conjunctival wound. When a narrowing of the nasolacrimal duct exists in addition to the canalicular stenosis, dacryocystorhinostomy should be performed in addition to lacodacryocystostomy, and the procedure is then designated as lacodacryocystorhinostomy. Very gratifying results have been obtained with these techniques.

A. Urrets-Zavalía, Jr.

Nectoux, R., and Suchet, A. **Lacrimal canaliculitis due to Veillonella parvula.** Ann. d'ocul. **186**:538-542, June, 1953.

During the course of an acute suppurative lacrimal canaliculitis, samples taken

from the lower canaliculus showed the presence of a gram-negative, anaerobic germ, Veillonella parvula. This microorganism is already known to be responsible for other suppurative conditions in man. Definite improvement followed ocular and nasal instillations of tyrothricin, considered the most active antibiotic agent against this organism, after other agents had failed. After incision and curettage of the canaliculus complete cure was attained. John C. Locke.

Nicholls, J. V. V. **Tumours of the lacrimal gland: With the report of a case of probable gumma.** Tr. Canad. Ophth. Soc. **5**:64-74, 1952.

The author reports five cases of tumor of the lacrimal gland one of which occurred in a 36-year-old farmer's wife who awakened to find her right upper lid drooping. A mass could be felt in the region of the lacrimal gland. The blood Wassermann was positive. Other diagnostic procedures were not significant. With treatment by penicillin, for the syphilis, the swelling of the lacrimal gland disappeared. Biopsy from the gland showed a granulomatous inflammation compatible with the diagnosis of gumma.

Neoplastic tumors of the lacrimal gland include mixed tumors, lymphosarcomas, and carcinomas. Mixed tumors probably arise from cell rests. They have a tendency to recur, and to eventually become carcinomatous. Surgical excision should be complete. They are not radiosensitive. (7 figures, 9 references)

John V. V. Nicholls.

Rundle, F. F. **Spastic and paralytic types of lid retraction in Graves' disease.** M. J. Australia **2**:605-608, Oct., 17, 1953.

There are two distinct types of lid retraction in Graves' disease, the one explicable on the basis of spasm of the levator palpebrae superioris (spastic type), the other associated with deficient elevation of the eye (paralytic type). Spastic retraction is most evident when the gaze is depressed. It is usually associated with a full range of upward movement, is the more common and more typical of Graves' disease. Paralytic retraction is most evident in the upward direction of the gaze and is aggravated by straining efforts at elevation. Its behaviour is satisfactorily explained on the basis of overinnervation of the levator palpebrae in the presence of superior rectus weakness. It occurs especially in the severe ophthalmic forms of Graves' disease, because of the high incidence of superior rectus palsy but this type is also encountered in a variety of other conditions associated with deficient elevation of the eye.

Ronald Lowe.

Santos, R. H. **A drainage protector in dacryocystorhinostomies.** Arch. oftal. Buenos Aires **28**:29-31, Jan., 1953.

The disagreeable and frequent sequel to this operation is the occlusion of the new opening which occurs during the first 10 or 15 days and is caused by an inflammatory swelling of the mucosa. To overcome this the author, who uses the Dupuy-Dutemps method for the operation, places an L-shaped strip of India rubber or some soft fabric, about 5 to 10 cm. long and 1 cm. wide between the lips of the wound, and leaves it in for 15 to 20 days. This is well tolerated, especially if vasoconstrictors (e.g. privin) are used. Joseph I. Pascal.

Straith, R. E. **Method of removing lesions of the lid margin.** Plast. & Reconstruct. Surg. **12**:291-293, 1953.

With drawings and photographs, the author describes a method of resecting a tumor (occupying less than a third) from the center of the lower lid. An incision is made about 4 mm. from and parallel to the margin across the lower two-thirds of the lid. Below the incision, the skin is

separated from the underlying tissues inferiorly to the base of the lid. The tumor and a full thickness zone of surrounding normal tissue are excised and the edges of the surgical coloboma united with sutures completely through all layers of the lid. The relatively large area of raised skin is transposed laterally and a triangular area approximately the same size as the tumor is removed below the lateral canthal angle. The author was unfortunate in being unable to obtain a postoperative photograph at a date later than the fourth postoperative day. Alston Callahan.

Vidal, Flaminio. **Patergica Zeissitis.** Arch. oftal. Buenos Aires **28**:34-36, Jan., 1953.

The term "patergy" was coined by Roessle in 1932 to describe the totality of pathologic manifestations produced by a state of altered reactivity of a tisue. The author describes patergic Zeissitis as a complication of medication. The pilosebaceous apparatus constitutes the primary organ of shock. Pruritis is the subjective symptom, and the objective signs are venous dilatation and scaly crusts, the latter as a result of the serous exudation which is a manifestation of the inflammatory reaction localized in the vascular connective tissue of the dermis.

John I. Pascal.

Viers, Everett R. **Treatment of lacrimal drainage system disorders.** Texas State J. Med. **49**:704-705, Sept., 1953.

The tear sacs of infants should be probed as soon as a diagnosis of purulent dacryocystitis is made. In children with persistent epiphora after many probings and in adults who have a stenosis of less than two years' duration, polyethylene tubing should be inserted. A dacryocystorhinostomy should be done if a large mucocele is present. The incision should be just below and 3 mm. medial to the internal canthal ligament. The bony opening must be large enough to insure good anastomosis. (4 references)

Irwin E. Gaynon.

16

TUMORS

Andrews, G. C., and Domonkos, A. N. **Skin hemangioma and retrolental fibroplasia.** A.M.A. Arch. Dermat. & Syph. **68**:320-322, Sept., 1953.

The authors report two cases of cutaneous hemangioma in infants. During the course of therapy the infants were found to be blind with advanced cicatricial retrolental fibroplasia. Premature infants with hemangioma should be observed for retrolental fibroplasia. (8 references)

Irwin E. Gaynon.

Bembridge, B. A., and McMillan, J. **Case notes: malignant melanoma occurring after evisceration.** Brit. J. Ophth. **37**: 109-113, Feb., 1953.

A detailed case report of malignant melanoma which was found in the orbit 16 years after evisceration of the eye is presented. Histologic sections did not show the origin of the tumor. It is likely that a neoplasm was already present at the time of the evisceration. Orbital recurrences after malignant melanoma occur very rarely. (6 figures, 12 references)

Orwyn H. Ellis.

Borner, R. **Two rare tumors of the iris.** Klin. Monatsbl. f. Augenh. **123**:157-166, 1953.

The first case is one of metastasis to the eye from a carcinoma of the breast 11 years after radical mastectomy. Many metastases were present in one eye (the other one was not affected) and one tumor was an implantation growth on the pupillary margin. The second tumor occurred in a 45-year-old man and was excised by iridectomy. The interpretation of the histologic picture was: lymphangioma, adenoma of the ciliary body or epithelioma

of the root of the iris. (4 figures, 42 references) Frederick C. Blodi.

Chitwood, Edmund M., Jr. **Chorioepithelioma of testis with bilateral choroidal metastasis.** A.M.A. Arch. Ophth. **50**:363-367, Sept., 1953.

The author describes what is believed to be the first reported case of bilateral choroidal metastasis from a chorioepithelioma of the testis. The patient was a 22-year-old white man. The diagnosis was made from postmortem findings. The antemortem diagnosis was melanoma. (5 figures) G. S. Tyner.

Clarke, Edwin. **Plasma cell myeloma of the orbit.** Brit. J. Ophth. **37**:543-554, Sept., 1953.

Multiple myelomatosis is not a particularly rare disease and is found in all parts of the body; however, it is rather infrequently found in the orbit. The disease is characterized by plasma cell tumors usually appearing in the bone marrow and spreading to many areas of the body. It is usually fatal within two years. The tumor must be differentiated from the plasmacytoma which is a benign disease very closely resembling it but which is not destructive. In the orbit it may occur as a primary tumor or may be secondary as a direct extension from neighboring tissues. The author describes two cases, in one of which the tumor was primary in the orbit and in the other secondary from the contiguous sinuses. In both an early ptosis and the proptosis of a space-taking lesion within the orbit occurred. X-ray studies revealed extensive destruction of the bone of the skull. Both patients died. (5 figures, 57 references) Morris Kaplan.

Cunningham, E. R. **Ocular tumours of West China, a statistical and clinical study.** Tr. Canad. Ophth. Soc. **5**:102-121, 1952.

This report covers 139 ocular and orbital tumors seen between 1935 and 1950 at the College of Medical Science, West China Union University, Chengtu, Szechuan. Beyond this series of tumors Cunningham has record of 115 cases of plasmoma of the orbit. In the majority of cases trachoma is present and may play a role in the development of the plasmoma. They recur again and again after excision. (21 references, 13 tables) John V. V. Nicholls.

Hamilton, J. Bruce. **Forty-six cases of orbital tumors occurring in Australia, including twenty-seven previously reported in 1949.** Tr. Ophth. Soc. Australia **12**:182-186, 1953.

There were 19 different types of tumor the commonest being dermoids and hemangiomata (six of each). Ronald Lowe.

Melis, Marco. **Hemolymphangioendothelioma of the lid.** Ann. di ottal. e clin. ocul. **79**:237-242, April, 1953.

A tumor on the upper lid in a patient aged 45 years was removed and the rare diagnosis of hemolymphangioendothelioma was made histologically. (2 figures, 20 references) John J. Stern.

Reese, Algernon B. **Pigmented lesion of the conjunctiva.** Tr. Ophth. Soc. Australia **12**:56-58, 1952.

Children are often brought for advice because a conjunctival nevus is conspicuous against the white sclera. Malignant growths from such lesions are extremely rare. The nevus is usually at the limbus in the palpebral aperture and is variably pigmented, but approximately 30 percent have no recognizable pigment and are of a salmon color. The melanin may increase rapidly especially at puberty, and a previously inconspicuous lesion may appear to grow quickly. Malignant growth is shown especially by increase in the nutrient vessels. All nevi should be excised.

This is simple and entails no hazards. Exenteration is essential for malignant nevi and half measures, such as local excision or enculeation, increase the mortality.

Melanosis may be congenital or acquired. Congenital melanosis may be within or beneath the conjunctiva. Stromal (subconjunctival) melanosis appears light brown to bluish gray. With the slitlamp spider-shaped stromal melanoblasts can be seen. The pigment is characteristically more marked around the emissaries of the anterior ciliary arteries. This stromal pigmentation is seen almost invariably in individuals who have an accentuation of pigment elsewhere over the body. The incidence is approximately 12 percent. This pigmentation never leads to malignant growth. Conjunctival melanosis is located in the basal layer of the epithelium and appears as a mottled area near the limbus. Its incidence is approximately 12 percent but it is not particularly associated with increase of pigment elsewhere. Clear striae sometimes course through the area especially when the site is at the upper or lower part of the limbus. It usually does not attract attention and so the possibility of malignancy is difficult to determine. Acquired melanosis is usually noted in adult life in middle age. The behaviour of this precancerous melanosis is most unusual and unpredictable. The lesion tends to increase in size in the course of one to ten years and then changes to cancerous melanosis. Precancerous melanosis is nonelevated, irregular in shape and may appear mottled because of varying density of pigment. The luster of the epithelium is disturbed and a black stippling is seen. There may be periods of regression and progression. The precancerous lesion usually progresses gradually and appears at multiple sites over the bulbar and palpebral conjunctiva; it is transformed insidiously into cancerous melanosis, a malignant tumor with a high mortality. Since elevation is unusual even in the malignant phase, the lesion may be considered innocuous by the ophthalmologist. The metamorphosis is often so gradual that clinically and histologically distinction is difficult. Uncertainty exists concerning treatment of precancerous melanosis. The lesion regresses under irradiation and this may be adequate but in other cases it becomes cancerous and needs exenteration. Malignant melanoma arising from precancerous melanosis is approximately 15 times more common than malignant melanoma arising from a nevus. Mortality from both types is extremely high. Ronald Lowe.

Reese, Algernon B. **Haemangiomas of the eye and adnexa.** Tr. Ophth. Soc. Australia **12**:187-191, 1953.

Hemangiomata do not behave as true neoplasms because they have limited powers of growth and are not metastogenic. Evidence is presented to support a relationship between retrolental fibroplasia and skin hemangiomata. Skin hemangiomata are self-limiting and treatment should be as conservative as possible. For small superficial skin lesions applications of carbon dioxide snow, and for deeper collections injections of sclerosing solutions are recommended. Cavernous orbital hemangiomata of adults are encapsulated and best excised by a Krönlein operation. Angiomatosis retinae is progressive and leads to retinal detachment and loss of sight. For single or localized lesions diathermy is advised but for diffuse or multiple lesions X ray is recommended. The treatment of port-wine skin hemangiomas is not satisfactory.

Ronald Lowe.

Reynon, and D'Haussy. **Exophthalmos secondary to a sarcoma of the ethmoid.** Ann. d'ocul. **186**:457-463, May, 1953.

In a 45-year-old man an ethmoidal chondrosarcoma invaded the orbit and

produced a serious degree of exophthalmos. The extension of the lesion did not allow surgical correction and treatment by irradiation proved unsuccessful, as was to be expected. The report points out the necessity of biopsy for the correct diagnosis of such tumors. (2 figures)

John C. Locke.

Strampelli, B. **Differentiation of Schwannoma and stromal melanoma of uvea.** Boll. d'ocul. **32**:301-304, May, 1953.

Referring to a paper by More and Ruffato (Boll. d'ocul., Nov., 1952) and to A. B. Reese's text on uveal melanomas, Strampelli stresses the importance of exact differentiation between the highly malignant and the relatively innocent types of uveal melanomas. (3 photomicrographs) K. W. Ascher.

de Vincentiis, M. **Fluorescein in the diagnosis of ocular tumors.** Klin. Monatsbl. f. Augenh. **123**:317-324, 1953.

Ten cc. of a 10 percent sodium fluorescein solution was injected intravenously. Four tumors of the lids were so examined and showed fluorescence with the Wood light. Three patients with intraocular neoplasms were also examined and the enucleated eye showed that the melanomas had taken up the dye. (15 references)

Frederick C. Blodi.

17

INJURIES

Barling, G. M. **Case notes: unusual case of intraocular foreign body.** Brit. J. Ophth. **37**:116-118, Feb., 1953.

An attempt to remove a nonmagnetic metallic foreign body was unsuccessful. Infection ensued and enucleation was necessary. By comparing carbon and stainless steel (which was present in this case) it was found that a force thirty times greater would be required to remove a piece of stainless steel than a similar-sized piece of carbon steel. (2 figures)

Orwyn H. Ellis.

Boley, J. P. **Eye injuries of serious import.** Tr. Canad. Ophth. Soc. **5**:12-19, 1952.

Twenty-five cases of ocular injury are described. These illustrate 1. non-perforating foreign bodies, 2. contusions, 3. punctures with and without retained foreign bodies, 4. lacerations, and 5. burns. (2 figures, 1 reference)

John V. V. Nicholls.

Callahan, Alston. **Treatment of penetrating traumatic injuries of the eye.** Rev. Peruana de otolaring. y oftal. **3**:3-17, Jan.-June, 1952.

An excellent presentation and discussion is made of the surgical approach to these difficult ophthalmologic problems.

Roberto Buxeda.

Clark, W., Dunphy, E., Rodman, S., Post, L., and Vail, D. **Initial treatment of acute injuries of the eye.** Bull. Am. Coll. Surgeons **38**:367-374, Nov.-Dec., 1953.

This treatise on early care of eye injuries has been written especially for the Committee of Trauma's forthcoming manual devoted to injuries, and designed to complement An Outline of the Treatment of Fractures now in its fourth edition. The article deals with the general considerations of ocular injuries, the principles of management, the history taking and the examination. It describes first-aid measures, and adjunct therapy, also the treatment and management of special types of injuries such as foreign bodies, injuries of the eyelids, abrasions, lacerations, contusions and concussions. Thermal burns and chemical burns are discussed in detail. Theodore M. Shapira.

Damato, F. J. **Treatment of lime burns of the eye with corvasymton and undermining of conjunctiva.** Brit. M.J. **2**:426-427, Aug. 22, 1953.

The author undermines the conjunctiva because a deposition of lime is retained beneath this membrane in cases of chemical burns. It is its gradual absorption that gives rise to the severe injury to conjunctiva, cornea and sclera. By loosening the tissue the formation of a deposit is prevented and the corvasymton is given access to the subconjunctival tissue. Corvasymton is an adrenalin-like substance and its therapeutic efficacy can be ascribed in its vasoconstrictory action. It is in 10-percent solution. (1 figure)

F. H. Haessler.

Elliot, A. J. **Visual results in carotid-cavernous fistulae.** Tr. Canad. Ophth. Soc. 5:20-33, 1952.

Ten cases of carotid-cavernous fistulas are reported in detail. These, and the literature, form the basis of a discussion of the symptoms and treatment of this disease.

The diagnosis rarely presents difficulty. A history of injury, commonly with fracture of the base of the skull, pulsating exophthalmos, and a constant bruit which is stopped by digital compression of the carotid artery, are characteristic. Aneurysm of the ophthalmic artery and vascular orbital tumors may simulate the condition but angiography will varify the diagnosis. Exophthalmos, venous engorgement of the eyelids, engorgement of the retinal veins, retinal haemorrhages, and papilledema all arise from the transmission of the pressure in the carotid artery to the cavernous sinus and the ophthalmic vein. The heart beat may be conveyed to the globe resulting in pulsating exophthalmos.

Preceding the development of exophthalmos there may be headache and buzzing noises in the head and ears. The noise may be heard anywhere in the head, but is usually most pronounced over the eye. Because of its free position in the cavernous sinus the sixth nerve often is affected. In longstanding cases optic atrophy or glaucoma may develop. The flow of blood between the internal carotid artery and the cavernous sinus will result in flow from all the collateral arteries into this area and the venous pressure in all the collateral veins will be greatly increased. The resulting retinal venous congestion and decrease in arterial pressure may seriously impair the nutrition of the retina, and vision.

Spontaneous cures are reported in two cases. Surgical treatment is not necessary unless proptosis, head noise, or impairment of vision are important findings. Cervical internal carotid ligation, after the establishment of adequate collateral drainage, is the procedure of choice. (1 table, 4 references)

John V. V. Nicholls.

Mariotti, L. **Ocular complications in head injuries.** Ann. di ottal. e clin. ocul. 79:307-336, June, 1953.

A statistical study of 136 cases of head injury with ocular disturbances revealed congestion of retinal vessels, hyperemia of the disc, paller of the disc, peripapillary retinal streaks, optic neuritis, optic atrophy, paralysis or paresis of extrinsic muscles, and loss of light reaction of the pupil. (50 references) John J. Stern.

Sédan, J., and Sédan-Bauby, S. **Cat-claw wounds of the cornea.** Ann. d'ocul. 186:444-451, May, 1953.

In 20 years the authors have observed nine cases of cat-claw wounds of the cornea, all serious. There were two complete recoveries, four relative recoveries, and in two patients enucleation became necessary. They investigate the reasons for such a serious prognosis and study common points between Debré's cat-claw disease and the cases observed. The absence of identifiable germs stands out above all. The use of terramycin and cortisone has considerably improved the prognosis, and

there is reason to hope that very soon the present statistics will only be of historical interest. (10 references)

John C. Locke.

18

SYSTEMIC DISEASE AND PARASITES

Bedrossian, R. H., Pocock, D. S., Harvey, W. F., Jr., and Sindoni, A. S. **Diabetic retinopathy treated with testosterone.** A.M.A. Arch. Ophth. **50**:277-281, Sept., 1953.

In a series of controlled clinical experiments, sex hormone therapy was of no value in the treatment of diabetic retinopathy.

G. S. Tyner.

Cremona, A. C. **Ocular manifestations of human brucellosis.** Arch. oftal. Buenos Aires **38**:166-172, April, 1953.

This report includes a systematic study of eye lesions in 160 patients, mostly young adults, with brucellosis, in most of whom the infecting Brucella had been isolated by blood culture. Slightly more than two-thirds of the patients had active brucellosis; the others were convalescent or had recovered over a year ago. Eye lesions were observed in 89 patients; venous congestion of the fundus oculi was seen in 76 patients, allergic conjunctivitis in 33. The most frequent eye troubles observed in Eastern brucellosis in Argentina are caused by Brucella suis and Brucella abortus.

Joseph I. Pascal.

Hiwatari, S. **Relationship between retinal and cranial angiosclerosis in Japanese hypertensive patients.** Acta Soc. Ophth. Japan **57**:479-483, July, 1953.

In 57 aged men, a necropsy was made of the retinal, cranial, cardiac and renal arteries. The development of the sclerotic processes in the retinal and cranial arteries was parallel, but it was not parallel to the sclerotic process in the renal and cardiac arteries. (4 figures, 6 tables)

Yukihiko Mitsui.

Lavat, Jean. **Ocular toxoplasmosis.** Arch. d'opht. **13**:252-271, March, 1953.

In a detailed study of ocular toxoplasmosis, Lavat reviews the literature with particular reference to clinical signs and diagnostic criteria. In an analysis of 20 cases in infants from the literature, in which the diagnosis had been made by demonstrating the parasites, he found the following frequent signs: microphthalmos, searching nystagmus, strabismus, iridocyclitis, malformations of the lens, including posterior lenticonus, and chorioretinitis with predominantly retinal involvement, stimulating pseudocoloboma of the macula. In the author's single personally-observed, proven case the child had, in addition to nystagmus, chorioretinitis, and intracranial calcifications, a strabismus varying in character from esotropia to exotropia. His presumptive cases he divided into three categories according to the serologic findings. The first category included cases having a high serological titre; the second, cases of feeble titre or a titre only in the mother; and the third, cases negative serologically but with chorioretinitic lesions suggestive of toxoplasmosis. Fundus drawings in color or black and white illustrate all cases. In concluding the author deplores the still great difficulty that obtains in making a diagnosis in vivo and the lack of effective therapy. (31 figures)

Phillips Thygeson.

North, D. P. **Ocular complications of mumps.** Brit. J. Ophth. **37**:99-101, Feb., 1953.

The literature is reviewed and the reported cases summarized. Two cases are reported in detail. One patient showed gelatinous nodules of the conjunctiva and uveitis appeared later. The other patient had had paresis of the sixth cranial nerve.

Both patients slowly recovered. (16 references) Orwyn H. Ellis.

Thiel, H. L., and Treixler E. **Unusual extension of a lipoid granulomatosis (Hand-Schüller-Christian) in the face.** Klin. Monatsbl. f. Augenh. 123:202-208, 1953.

A 68-year-old man presented himself with a dense infiltration of both lids on each side. A slight exophthalmos was present at the same time. With the exception of an enlarged liver the medical examination revealed no abnormality. A biopsy was done and the tissue proved to be a granulation tissue around foam cells. The condition improved on X-ray treatment and a fat-poor diet. (2 figures, 20 references) Frederick C. Blodi.

Vail, Derrick. **Diffuse collagen diseases with ocular complications. (The Mary Louise Prentice Montgomery Lecture 1952)** Tr. Ophth. Soc. U. Kingdom 72: 155-169, 1952.

The author reviews the literature on the affections of the collagen tissue and points out the similarity of such diseases as disseminated lupus erythematosus, periarteritis nodosa, rheumatic fever, thromboangiitis obliterans, erythema nodosum and multiform anaphylactoid purpura, antigenic pneumonia, serum sickness and probably calcinosis. The ocular lesions found in association with these diseases and affecting the collagen tissues of the eye are toxic retinopathy, retinal hemorrhages, papilledema, edema of eyelids, conjunctivitis, corneal edema, cataracts, defects of the visual fields, perivasculitis, retinal separation, uveitis, episcleritis, tenonitis, palsies of ocular muscles, nystagmus, exophthalmos, keratitis and scleral necroses. The characteristic remissions and exacerbations of the inflammatory reactions in the two conditions are highly suggestive of an allergotoxic reaction. Beulah Cushman.

19

CONGENITAL DEFORMITIES, HEREDITY

Kerkenezov, N. **Congenital toxoplasmosis: a case report:** M. J. Australia 2:262, Aug. 15, 1953.

Bilateral macular colobomas, intracerebral calcification and serum antibodies in a child, aged 7 years are described. Ronald Lowe.

Mann, Ida. **The changing attitude to developmental abnormalities: a review.** Tr. Ophth. Soc. Australia 12:20-27, 1952.

Atavism should no longer be invoked to explain developmental abnormalities. Today the genes are thought to be enzymatic units regulating biochemical processes. The examination of fully developed abnormalities may give no clues to the actual cause which may be only determined by examination of embryos. The primary disturbance may cause numerous widespread secondary defects leading to variations within syndromes. Lesions determined genetically may appear to be inflammatory or due to senile degeneration. Children should be trained so that they can make the most of their defective sight. Ronald Lowe.

Pietruschka, G. **Osteopetrosis (Albers-Schönberg disease) and its differential diagnosis.** Klin. Monatsbl. f. Augenh. 123:189-201, 1953.

This is a hereditary disease characterized by a severe, diffuse, and congenital osteosclerosis (marble bones). Optic atrophy and exophthalmus occur. Anemia is frequent because a large part of the bone-marrow is replaced by osseous tissue. Three cases are presented, two of which occurred in siblings. In all three there was bilateral optic atrophy and exophthalmus. The X-ray picture will establish the diagnosis. (12 figures, 18 references) Frederick C. Blodi.

Reiser, K. A. **The Bonnevie-Ullrich syndrome.** Klin. Monatsbl. f. Augenh. **123**:180-183, 1953.

This syndrome is a combination of multiple somatic defects. This congenital anomaly may include paresis of extraocular muscles and lid defects. A 34-year-old woman with this syndrome is presented. There was an abducens paralysis on the affected side. (1 figure, 5 references)

Frederick C. Blodi.

Szlazak, J. **Treacher Collins syndrome.** Canad. M.A.J. **69**:274-276, Sept., 1935.

Treacher Collins syndrome is the proper name for a condition often called mandibulo-facial dysostosis or Franceschetti syndrome. Among many characteristics described are the square forehead, lack of angulation in the naso-frontal region and long occipito-frontal diameter (profile of the head of a fish). Deformities of the facial bones with hypertrophic maxillary arch and malgrowing teeth and retruded mandible are frequent. A narrowed interpalpebral space, notching on the outer portion of the lower eyelid, irregular eyelashes, lateral deviation or protrusion of the eyeball with congenital ptosis and absent lacrimal glands are often described. Deformities of the ears, nose, mouth and cheeks are also listed. (8 figures, 3 case reports) Herman C. Weinberg.

Tower, Paul. **Coloboma of lower lid and choroid, with facial defects and deformity of hand and forearm.** A.M.A. Arch. Ophth. **50**:333-343, Sept., 1953.

This is a case report of the unusual occurrence of unilateral coloboma of the inner one-third of the lower lid associated with coloboma of the choroid, cleft lip and congenital anomalies of the hand and forearm. Excellent photographs are included. (7 figures) G. S. Tyner.

Ullrich, O., and Fremerey-Dohna, H. **The syndrome of congenital dyscephaly, hypotrichosis and cataract.** Ophthalmologica **125**:144-154, March, 1953.

The syndrome described by the authors in a previous communication (Ophthalmologica 125:73, Feb., 1953) consists of a gross deformity of the skull due to dehiscence of the sutures and hypoplasia of the mandible, hypotrichosis over the sutures and congenital cataract. The syndrome shares some of its characteristics with craniofacial and cleidocranial dysostosis. In the present paper the authors, largely by theoretical reasoning, arrive at the conclusion that their syndrome occurs as a result of defective differentiation in the ventral region of the head during the fifth to sixth week of intrauterine life. (18 references) Peter C. Kronfeld.

Venturi, G. **A rare congenital syndrome: unilateral external oculomotor paralysis with Claude Bernard Horner syndrome and heterochromia in a child with partial status dysraphicus.** Boll. d'ocul. **32**:556-566, Sept., 1953.

The case of an 8-year-old girl with the above-named anomalies is extensively described. Other malformations were: hypoplasia of the left half of the thorax, facial hemiatrophy, septum deviation, prognathism, dental anomalies, and abnormal position of the left malleus. (3 figures, 47 references) K. W. Ascher.

Zunin, C., and Mariotti, L. **Ocular anomalies in Bonnevie-Ullrich's syndrome.** Ann. di ottal. e clin. ocul. **79**:359-376, July, 1953.

After discussing the present knowledge of this rare syndrome which is characterized by multiple congenital malformation, the authors present nine cases of their own, all of which showed fundus changes. These consisted either of changes of form or size of the optic disc, or vascular anomalies like abundance of branches and occurrence of multiple cilio-

retinal arteries, or both. (9 figures, 25 references) John J. Stern.

20

HYGIENE, SOCIOLOGY, EDUCATION, AND HISTORY

Bailliart, P. **Causes of blindness leading to admission to an institution for young blind people.** Ann. d'ocul. **186**:481-487, June, 1953.

The statistics presented deal with 34 young people admitted to the Institution during October, 1952. Congenital glaucoma was the cause of blindness in eleven subjects and congenital cataract in six; the other causes were optic atrophy, pigmentary retinopathy, trauma, congenital nystagmus, microphthalmus, bilateral enucleation, probably for retinoblastoma, and unknown infection. In none of the congenital glaucomas was the occurrence familial; it was in congenital cataract. Maternal infection during pregnancy was not a factor in any of the cases. Ophthalmia neonatorum and interstitial keratitis have disappeared as causes of blindness in infancy. It is not surprising that there were no cases of retrolental fibroplasia in this series since the admission age was very rarely below 8 years. The small prematures affected with this disease can hardly be expected for another two or three years. John C. Locke.

Casanovas, Jose. **Determination of visual aptitudes in industry.** Arch. Soc. oftal. hispano-am., **13**:463-476, May, 1953.

Casanovas briefly reviews the literature on the apparatus in use in the United States, such as the orthorater, the sight-screener and the telebinocular. He maintains that equally reliable data can be obtained without these instruments. The pattern of examination which he proposes comprises the determination of visual acuity for each eye separately and for both together, for distance and near, with the use of a polaroid filter; of color vision with kodachrome transparencies of pseudoisochromatic charts; of depth perception with a stereoscope; and of phorias by means of the Maddox rod. The advantages claimed for a routine examination of employees in industry are a more efficient selection and placement of workers, reduction in the cost of apprenticeship and training, indications for treatment with the objective of increased efficiency, the possibility of retaining workers of long experience, reduction in the incidence of accidents, reduction of defective production, increased production per worker, and, as a consequence of the above mentioned advantages, better relations between employers and employees. (10 figures, 48 references)

Ray K. Daily.

Choyce, D. P. **Ocular tuberculosis.** Tr. Ophth. Soc. U. Kingdom **72**:279-289, 1952.

The author introduced the Swanley unit, Kent, at the Whiteover Hospital, a national sanatorium of the United Kingdom for treatment of ocular tuberculosis, opened in June, 1951. The patients stay a minimum of several months. The diagnosis is made by clinical picture including the examination of biopsy specimens if available, the presence of healed or nearly healed systemic lesions in the patient, a family history of tuberculosis, and the exclusion of other possible etiologic factors such as syphilis, toxoplasmosis and brucellosis. The Middlebrook-Dubos test, in which varying dilutions of the patient's serum are used to agglutinate suspensions of sheep's red cells which have been sensitized to human or bovine strains of the tubercle bacillus, is used. Of the 19 patients treated in the first nine months, marked improvement was noted in five, slight improvement in eight, no change in four and deterioration in four. The Swanley unit hopes to make a solid contribution to the understanding of ocular tuberculosis. Beulah Cushman.

NEWS ITEMS

Edited by Donald J. Lyle, M.D.
601 Union Trust Building, Cincinnati 2

News items should reach the editor by the 12th of the month, but, to receive adequate publicity, notices of postgraduate courses, meetings, and so forth should be received at least three months before the date of occurrence.

Deaths

Dr. Alvin Hermann, Ann Arbor, Michigan, died August 20, 1953, aged 46 years.

Dr. Henry G. Glazer, New York City, died November 6, 1953, aged 56 years.

Announcements

Grant-in-aid applications

The National Council to Combat Blindness announces the launching of its Fellowship program, with the objective of meeting the existing shortage of trained research workers in the field of ophthalmology and its related sciences and to encourage specialized research study. Under the conditions of these fellowships the applicants are required to make their own arrangements for suitable research facilities with recognized institutions.

The first three candidates awarded fellowships by the National Council to Combat Blindness and the institutions at which they will work are:

Edgar Auerbach, M.D. ("Retinal physiology"), University Hospitals, State University of Iowa.

Torvard Laurent ("Influence of ascorbic acid on the shape and size of the hyaluronic acid molecule in the presence of different inorganic ions and at different hydrogen ion concentrations"), Retina Foundation, Massachusetts Eye and Ear Infirmary, Boston.

Stanley Jerold Solomon ("Fine structure of photoreceptors"), Eye and Ear Hospital, Pittsburgh.

Grant-in-aid awards approved by the organization's Scientific Advisory Committee for the fiscal year 1953-54 are as follows:

New York University Post Graduate Medical School, Goodwin M. Breinin, M.D., $1,620, "Neotetrazolium studies in the eye (dehydrogenase tracing)" (continuation); University Hospitals, State University of Iowa, Hermann M. Burian, M. D., $3,000, "Studies in electroretinography"; University of Pittsburgh School of Medicine, T. S. Danowski, M.D., and Lawrence Greenman, M.D., $2,500, "Studies of factors affecting the development of galactose cataracts"; Presbyterian Hospital Medical Center, Institute of Ophthalmology, William G. Everett, M.D., $1,000, "Mensuration of living eye by X ray and relation of measurements to pathologic states" (continuation); Wills Eye Hospital, Philadelphia, Harry Green, Ph.D., and Irving H. Leopold, M.D., $3,000, "Investigation of the intermediary reactions and the enzyme systems involved in lens metabolism;" University of Chicago School of Medicine, Arlington C. Krause, M.D., $950, "Toxoplasma in domestic animals" (continuation); Government Hospital, Haifa, Israel, I. C. Michaelson, M.D., $3,000, "Factors affecting new vessel growth, particularly in the cornea"; Tulane University Medical School, J. William Rosenthal, M.D., $400, "A genetic study of the spherophakia, glaucoma, brachydactyly syndrome"; Cerrahpasa Hospital, Istanbul, Turkey, Necdet Sezer, M.D., $2,000, "Characterization of the virus of Behçet's disease" (continuation); Indiana University Medical Center, Fred M. Wilson, M.D., $1,500, "Experimental study of effects of beta irradiation"; Eye and Ear Hospital, Pittsburgh, Jerome J. Wolken, Ph.D., $1,200, "Fine structure of photoreceptors"; Stanford University School of Medicine, San Francisco, Max Fine, M.D., $2,500, "Inhibiting effect in serum of patients with sarcoidosis (ocular and other) upon the hemoagglutination test for tuberculosis and other agglutination reactions."

Applications for 1954-55 fellowship and grant-in-aid awards of the National Council to Combat Blindness will be considered by the organization's Scientific Advisory Committee at its fifth annual meeting to be held in the spring of 1954. Completed applications should be received in the office of the Council no later than April 15, 1954. Application forms may be obtained by addressing: Secretary, National Council to Combat Blindness (at the Council's new address), 30 West 59th Street, New York 19, New York.

The Scientific Advisory Committee of the organization was enlarged to 13 members and now includes: Dr. James H. Allen, professor of ophthalmology, Tulane University of Louisiana School of Medicine, New Orleans; Dr. Alson E. Braley, director, Department of Ophthalmology, University Hospitals, State University of Iowa College of Medicine, Iowa City; Dr. Louis B. Flexner, professor of anatomy, University of Pennsylvania School of Medicine, Philadelphia; Dr. Dan M. Gordon, assistant professor of clinical surgery, Department of Ophthalmology, New York Hospital-Cornell Medical Center, New York; Charles Haig, Ph.D., Department of Physiology and Pharmacology, New York Medical College, Flower and Fifth Avenue Hospitals, New York; Dr. A. E. Maumenee, chief, Division of Ophthalmology, Stanford University School of Medicine, San Francisco; Dr. Karl Meyer, associate professor of biochemistry, College of Physicians and Surgeons, Columbia University, New York; Dr. Stuard Mudd, professor of bacteriology, University of Pennsylvania, Philadelphia; Dr. Charles A. Perera, assistant clinical professor of ophthalmology, Columbia University College of Physicians and Surgeons, New York;

Lorrin A. Riggs, Ph.D., professor, Department of Psychology, Brown University, Providence; Dr. Samuel L. Saltzman, M.D., assistant clinical professor of ophthalmology, New York Medical College, Flower and Fifth Avenue Hospitals, New York; Dr. Kenneth C. Swan, M.D., professor, Department of Ophthalmology, University of Oregon Medical School, Portland; and Dr. Phillips Thygeson, M.D., professor of ophthalmology, University of California School of Medicine, San Francisco.

Eye-Bank advisory committee

The Eye-Bank for Sight Restoration, Inc., New York, announces that the Honorable Thomas E. Dewey, Governor of the State of New York, has accepted honorary membership on the Eye-Bank Council, and that a National Advisory Committee of distinguished ophthalmologists, representing a cross-section of the country, has been formed to serve the Eye-Bank.

The members of this National Committee and their areas of service are:

Dr. Michael J. Hogan and Dr. S. Rodman Irvine, California; Dr. Derrick Vail, Illinois; Dr. James H. Allen, Louisiana; Dr. Alan C. Woods and Dr. M. Elliott Randolph, Maryland; Dr. Edwin B. Dunphy, Massachusetts; Dr. A. D. Ruedemann, Michigan; Dr. M. Hayward Post, Missouri; Dr. John H. Dunnington, Dr. John M. McLean, and Dr. R. Townley Paton, New York; Dr. Frederick W. Stocker, North Carolina; Dr. Harold G. Scheie, Pennsylvania; Dr. Everett L. Goar, Texas.

Gill Hospital congress

Speakers at the 27th annual spring congress of the Gill Memorial Eye, Ear, and Throat Hospital to be held at Roanoke, Virginia, April 5th through 10th, include: Dr. Edwin B. Dunphy, Boston, guest-of-honor; Dr. Alson E. Braley, Iowa City; Dr. Webster H. Brown, Baltimore; Dr. Louis H. Clerf, Philadelphia; Dr. Lewis L. Coriell, Camden; Dr. Winchell McK. Craig, Rochester, Minnesota.

Mr. John Foster, Leeds, England; Dr. Victor Goodhill, Los Angeles; Dr. Paul R. Hawley, Chicago; Dr. Hayes Martin, New York; Dr. Wright H. Langham, Los Alamos, New Mexico; Dr. John M. McLean, New York.

Dr. George R. Merriam, Jr., New York; Dr. Roger S. Mitchell, Trudeau, New York; Dr. George W. Murgatroyd, Jr., Baltimore; Dr. C. Stewart Nash, Rochester, New York; Dr. Donald F. Proctor, Baltimore; Dr. M. Elliott Randolph, Baltimore.

Dr. John R. Richardson, Boston; Dr. Charles L. Schepens, Boston; Dr. Edmund B. Spaeth, Philadelphia; Dr. H. Saul Sugar, Detroit; Dr. Harvey E. Thorpe, Pittsburgh.

Resident members who will participate in the program are:

Dr. Elbyrne G. Gill, Dr. Houston L. Bell, Dr. Eugene W. Higgins, Dr. Robert B. Jones, Jr., and Dr. Arnold H. Miller.

Pan-American Interim Congress

The III Interim Congress of the Pan-American Association of Ophthalmology will be held in São Paulo, Brazil, June 11 to 17, 1954, in conjunction with the VIII Brazilian Congress of Ophthalmology and the XIX International Congress of Oto-Neuro-Ophthalmology.

The subjects for the Pan-American Congress will be "Recent progresses in therapy" and "Prevention of blindness." The themes for the Brazilian Congress will be "Uveitis" and "Keratoplasty."

Simultaneous translation in English, Portuguese, and Spanish will be available, enabling each participant in the congress to hear the various reports in his own language. There will be surgical demonstrations and round-table discussions.

A very elaborate social program has been organized including a cocktail party before the opening ceremony, a barbecue dinner and typical Brazilian dances, excursions to the beaches of Santos and to a coffee plantation, as well as lunch at the fashionable Jockey Club, where special races will be held in honor of our guests.

All participants in the Congress who register by the end of February, 1954, will receive a personal invitation to a private dinner party at the home of a Brazilian colleague. Naturally, English-speaking participants will be asked to homes where the hosts are bilingual. There will be a closing banquet and dance.

The registration fee will be $10.00 and members of the Pan-American Association of Ophthalmology are entitled to a rebate of 30 percent. The registration fee will cover many of the events, and registration in one congress automatically entitles the registrant to the privileges of attending the other two congresses.

Mr. H. H. Allen, President of the Allen Travel Service, Inc., 50 Fifth Avenue, New York 36, who arranged the Interim Meeting-Cruise last January, has outlined both steamship and air transportation arrangements to your III Interim Congress, as well as a number of optional return routings via Buenos Aires, Rio de Janeiro, the West Coast, and so forth. His firm stands ready to handle all burdensome details in connection with transportation.

Societies

Philadelphia officers

The new officers of the Section on Ophthalmology, College of Physicians of Philadelphia, are: Chairman, Dr. Edmund B. Spaeth; clerk, Dr. William E. Krewson, 3rd.

Brooklyn program

At the 126th regular meeting of the Brooklyn Ophthalmological Society, the paper by Dr. Arthur G. DeVoe, "Corneal dystrophies and degenerations," was discussed by Dr. Ralph I. Lloyd, and the paper by Dr. A. Benedict Rizzutti, "Surgical treatment of implantation cyst of the iris," was discussed by Dr. J. Arnold deVeer. Dr. Jesse M. Levitt presented a paper on "Traumatic implantation of cilium into the anterior chamber."

Egyptian meeting

The annual meeting of the Ophthalmological Society of Egypt will take place at the Memorial Ophthalmic Laboratory, Giza, Egypt, on Friday and Saturday, March 12 and 13, 1954, at 9 a.m. Medical practitioners, oculists or otherwise, are cordially invited.

Wills clinical conference

Dr. Burton C. Chance, Philadelphia, attending surgeon at the Wills Eye Hospital from 1915-1933 and consulting surgeon since 1933, was guest-of-honor at the sixth annual clinical conference of the staff and ex-residents of the Wills Eye Hospital, February 19th and 20th.

Papers presented at the conference were: Dr. Irvin Levy, "The use of plasma and thrombin solutions in ulcerations and injuries of the cornea"; Dr. E. Howard Bedrossian, "Anomalous retinal correspondence in alternating squint: Incidence and influence on surgical results."

Dr. Arthur H. Keeney, "New lens materials: Indications and hazards"; Harry Green, Ph.D., and Carol Bocher, M.S., "Lens metabolism: Experimental studies"; Virginia L. Weimer, Ph.D., Harry Green, Ph.D., and Dr. Irving H. Leopold, "Steroid content of aqueous humor: Further studies"; Dr. J. W. Hallett, Dr. Irving H. Leopold, Dr. K. Naib, and T. Domica, "Evaluation of newer antibiotics."

Dr. Henry Wudka and Dr. Irving H. Leopold, "Studies of the choroidal circulation"; Dr. Stanley Capper and Dr. Irving H. Leopold, "Study of the mechanism for the production of choroidal detachment"; Dr. J. Eisenberg, Dr. Irwin Terner, and Dr. Irving H. Leopold, "Present status of radioactive phosphorus (P_{32}): For diagnosis of intraocular pathology."

Dr. Turgut M. Hamdi, "The objective evaluation of vision through optokinetic nystagmus"; Dr. Edmund B. Spaeth, "The treatment of ocular tumors"; Dr. Nathan S. Schlezinger and Dr. James F. O'Rourke, "Ocular manifestations in a series of 100 verified brain tumors"; Dr. Rudolph Jaeger and Dr. Carroll R. Mullen, "Disorders of the intracranial ocular mechanism caused by thrombosis of the internal carotid artery."

The Arthur J. Bedell Lecture was to have been presented by Dr. Daniel B. Kirby. Due to Dr. Kirby's untimely death, the paper was read by a member of the Wills Eye Hospital staff. The subject was "Various means of direct separation of the zonule in intracapsular cataract surgery."

Richmond officers

Officers of the Richmond (Virginia) Eye, Ear, Nose and Throat Society are: President, Dr. L. B. Sheppard; secretary-treasurer, Dr. Charles N. Romaine. The society meets at the Commonwealth Club on the first Tuesday of January, March, May, and October.

Midwestern Research section

Papers presented at the meeting of the Midwestern Section of the Association for Research in Ophthalmology at Chicago on February 7th were: "Metabolic studies of lens epithelium in vitro," Dr. Bernard Schwartz, Miss Betty Danes, and Dr. P. J. Leinfelder, Iowa City; "Further contributions to the enzymology of corpus vitreum," Dr. Albert Zeller, Chicago.

"The Liebmann effect in binocular perception," Dr. Maressa Hecht Orzack and Dr. T. F. Schlaegel, Jr., Indianapolis; "Uveitis: A preliminary report," Dr. Howard D. Ostler, Iowa City; "Studies in flicker fusion of the eye," Dr. Garth J. Thomas, Chicago; "Variations in quality of target for flicker fusion fields," Dr. Claude Trapp and Dr. Paul W. Miles, Saint Louis; "Some effects of Yttrium 90 upon the posterior ocular segment," Dr. Frank W. Newell, Dr. Paul V. Harper, and Dr. Aune M. Koistinen, Chicago.

"After-image transfer tests in anomalous correspondence," Dr. A. K. Hansen, Iowa City; "Preliminary studies in the aqueous following radiation of the eye," Dr. David Schoch and Dr. Irving Puntenney, Chicago; "Seton procedure in glaucoma," Dr. Edward Pushkin, Dr. A. C. Biegel, and Dr. Martha Folk, Chicago; "The electroretinogram in choroideremia," Dr. George W. Bounds, Jr., and Dr. Theodore Johnston, Iowa City; "Electroretinography in artificial partial avitaminosis," Dr. Robert J. Davis, Iowa City.

Pathology course

The Department of Ophthalmology, Washington University School of Medicine, announces an intensive one-week course in pathology of the eye and adnexa from May 17 through May 22, 1954.

This course will consist of approximately 40 hours of instruction, both didactic and microscopic. Given in the eye pathology laboratories by Dr. T. E. Sanders and Dr. Bernard Becker, it will cover essentially the material presented in the pathology instruction offered during the department's eight-month course in the basic sciences of ophthalmology.

The course will be limited. The fee will be $150.00, of which $25.00 is payable at the time of acceptance. All communications should be addressed to the Department of Ophthalmology, Washington University School of Medicine, 640 South Kingshighway Boulevard, Saint Louis 10, Missouri.

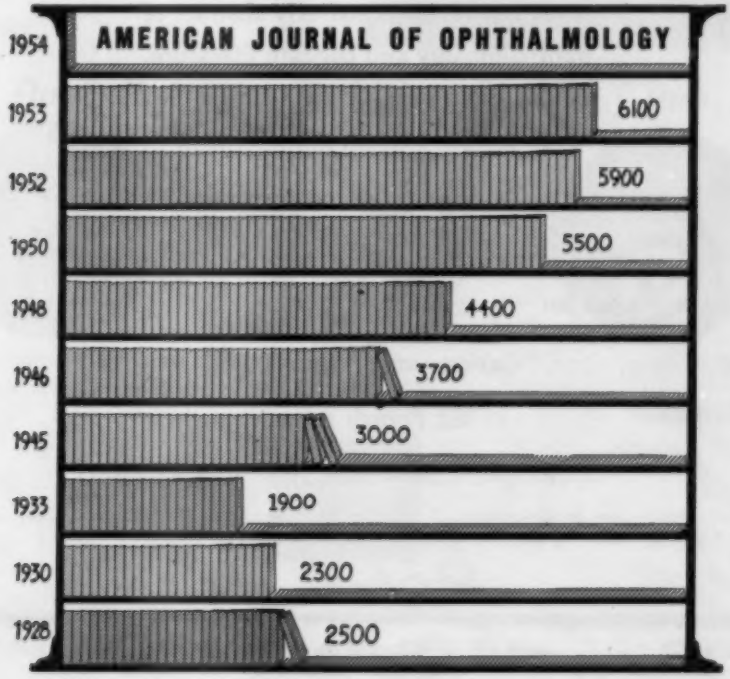
Birmingham Eye Foundation

The Eye Foundation, Inc., of Birmingham, Alabama, has received $77,500 in donations which has been used to purchase a quarter of a block of land adjacent to the Medical School in Birmingham. Mrs. R. I. Ingalls, Sr., is chairman of the board and Dr. Alston Callahan is president.

Personals

Dr. J. Lavat of Paris has been awarded the Chibret prize for 1953 by the French Society of Ophthalmology for his work on ocular toxoplasmosis.

PRESCRIPTION OPTICIANS



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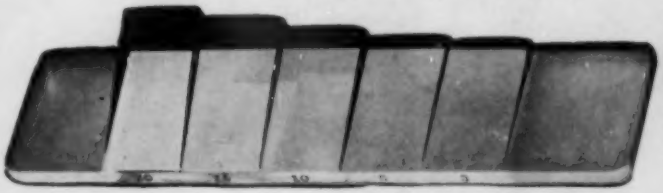

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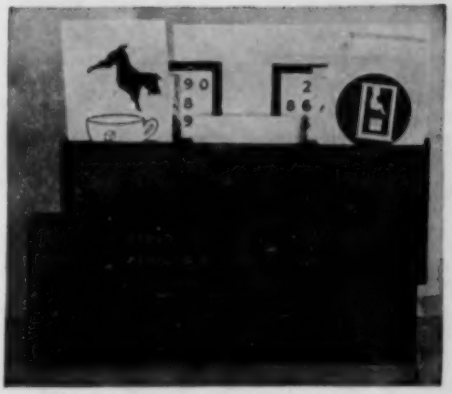

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